

Japanese earthworms: a synopsis of the Megadrile species (Oligochaeta)



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Contents

Introduction	33
Geographical affinities of the Japanese earthworm fauna	34
Classification and Checklist of Japanese earthworms	35
Taxonomy	36
Moniligastridae	37
Biwadrilidae	39
Lumbricidae	40
Ocnodrilidae	44
Acanthodrilidae	45
Octochaetidae	46
Megascolecidae	46
References	61

Introduction

Earthworms play an important part in the soil ecosystem where they participate in organic matter cycles and improve soil structure. They make nitrogen available for plant growth by feeding on organic material in the soil and voiding casts which have a low C/N ratio; in addition the casts contain fragmented litter which is readily broken down by micro-organisms to produce further nitrogen for plant growth. During ingestion the soil particles are ground down in size while the subsequent casts produce a turnover of the soil. Their burrows improve soil aeration and drainage. Although the activities of earthworms are beneficial to man, the worms may be vectors of protozoan, cestode or nematode parasites of mammals and birds which commonly infest pigs and poultry.

Earthworms may be very numerous in suitable habitats. One of the highest populations records was that of 845 individuals per square metre (total live weight 245 gm) from an orchard in Europe (Raw, 1959) and populations of 250 per square metre are frequently encountered in grasslands. Over 70 species of earthworms have been recorded from Japan and represent seven of the seventeen currently recognized families of the 'Megadrilacea'. In view of the importance of the group in soil fertility and their common occurrence, it is surprising that no comprehensive study has been published on the rich earthworm fauna of Japan. This situation has compelled the student needing to identify specimens, laboriously to search for matching descriptions scattered throughout the scientific literature beginning with Michaelsen's monograph (1900). A task made all the more difficult by numerous nomenclative changes which have taken place during the last 80 years. It is intended that the present work should go some way to make good this omission and provide a preliminary guide to the many species which have been reported. The Japanese species of the families Biwadrilidae, Lumbricidae, Ocnodrilidae, Acanthodrilidae and Octochaetidae have been studied extensively but not so the species of the genus *Drawida* (family Moniligastridae) and of the *Pheretima* group of genera (*Amyntas*, *Metaphire*, *Pheretima*, *Pithemera* and *Poly-*

pheretima in the family Megascolecidae) which together constitute the majority of the Japanese earthworm fauna. The present synopsis brings together the records of all earthworms reported from Japan under their currently accepted names. Distributions within Japan and where appropriate, elsewhere in the world are also given. Diagnoses and keys are provided for the identification of all indigenous and introduced earthworms with the exception of the poorly known species of the genus *Drawida* for which only the diagnostic characters are tabulated. Information on species of the *Pheretima* group of genera is derived from current revisionary studies (Easton, 1979 and in preparation).

Geographical affinities of the earthworm fauna of Japan

The autochthonous (indigenous) species of the Japanese earthworm fauna have diverse origins and geographical affinities. Although Japan forms part of the Holarctic geographical region, only one indigenous earthworm family, the Lumbricidae, has a holarctic distribution. The Lumbricidae occur naturally in the eastern parts of North America and throughout the Palaearctic. The majority of species of this family have been recorded from the western Palaearctic; a few are known to be indigenous to Siberia and only a single species, *Eisenia japonica*, occurs naturally in Japan at the easternmost limit of the family range. The presence of indigenous taxa in both North America and the Palaearctic suggests that the family is of considerable antiquity, predating the formation of the North Atlantic during the Eocene. Several species of Lumbricidae are allochthonous (peregrine) and some, listed below (p. 35), have successfully colonized Japan, presumably after introduction by man.

Elements of the fauna of the Oriental Region are represented in Japan by eight species of the genus *Drawida*, family Moniligastridae, which is also present in Korea, Manchuria and eastern Siberia as well as most of the Oriental Region. The family Moniligastridae contains four other genera, these inhabit India and southeast Asia including the Philippines and the islands to the west of Wallace's line. It is apparently of recent Indian origin and has affinities with the African family Alluroideidae (Jamieson, 1978). Possibly the family invaded Asia after the collision of the Indian and Asian plates during the Tertiary period.

The majority of the earthworms in Japan belong to the *Pheretima* group of genera (family Megascolecidae), the dominant earthworm group throughout southern mainland Asia, the Indo-Australasian Archipelago and the islands of the south-western Pacific. Most other Megascolecid genera occur in India or Australia and it has been suggested that the *Pheretima* group originated in the New Guinea/North Australia area and invaded Asia by way of the Indo-Australasian Archipelago during the Miocene or Oligocene (Easton, 1979). Several species of the *Pheretima* group are allochthonous, for example the Indonesian *Polypheretima elongata*, and have been introduced into Japan by man.

The family Biwadrilidae is of uncertain zoogeographical provenance being known from the single species *Biwadriilus bathybates* which is restricted to Japan and has the distinction of being the only member of the superfamily Biwadriiloidea. This species has several primitive characters (male pores on segment 13; an unspecialized morphology and lateral lines) and is aquatic. Its Japanese distribution is considered to be a relict of a once, more widespread range (Sims, 1980).

Other Japanese species cannot be included in the groups discussed above. *Pontodrilus matsushimensis* (family Acanthodrilidae) is littoral and has also been recorded from New Caledonia and Chatham Island; it may occur on many other beaches of the Pacific. The four species included in the genus are found on beaches of the tropical and warmer temperate regions of the world. Three other genera recorded from Japan, *Ocnerodrilus* (Ocnerodrilidae), *Microscolex* (Acanthodrilidae) and *Dichogaster* (Octochaetidae) are allochthonous (not indigenous to the region) and have been introduced from tropical countries through the agency of man.

Classification and checklist of Japanese earthworms

(After Sims, in press)

Order Moniligastrida

Family Moniligastridae

- Drawida hattamimizu* Hatai, 1930
- D. japonica* Michaelsen, 1892
- D. keikiensis* Kobayashi, 1938
- D. koreana* Kobayashi, 1938
- D. moriokaensis* Ohfuchi, 1938
- D. nemora* Kobayashi, 1936
- D. onfunatoensis* Ohfuchi, 1938
- D. tairaensis* Ohfuchi, 1938

Order Haplotaxida

Suborder Lumbricina

Superfamily Biwadriloidea

Family Biwadrilidae

- Biwadrilus bathybates* (Stephenson, 1917)

Superfamily Lumbricoidea

Family Lumbricidae

- Aporrectodea trapezoides* species complex
 - A. caliginosa* (Savigny, 1826)
 - A. trapezoides* (Duges, 1828)
- Bimastos parvus* Eisen, 1874
- Dendrobaena octaedra* (Savigny, 1826)
- Dendrodrilus rubidus* (Savigny, 1826)
- Eisenia fetida* (Savigny, 1826)
- E. japonica* (Michaelsen, 1892)
- E. rosea* (Savigny, 1826)
- Lumbricus* sp.

Superfamily Megascolecidea

Family Onerodrilidae

- Onerodrilus occidentalis* Eisen, 1878

Family Acanthodrilidae

- Microscolex phosphoreus* (Duges, 1837)
- Pontodrilus matsushimensis* Iizuka, 1898

Family Octochaetidae

- Dichogaster bolau* (Michaelsen, 1891)
- D. saliens* (Beddard, 1893)

Family Megascolecidae

- Amyntas acinctus* (Goto & Hatai, 1899)
- A. corticus* (Kinberg, 1867)
- A. flavescens* (Goto & Hatai, 1898)
- A. glabrus* (Gates, 1932)
- A. gracilis* (Kinberg, 1867)
- A. habereri* (Cognetti, 1906)
- A. hilgendorfi* species-complex
 - A. agrestis* (Goto & Hatai, 1899)
 - A. ambiguus* (Cognetti, 1906)
 - A. communissimus* (Goto & Hatai, 1899)
 - A. glandularis* (Goto & Hatai, 1899)
 - A. gomejimensis* (Ohfuchi, 1937)
 - A. hilgendorfi* (Michaelsen, 1892)

- A. irregularis* (Goto & Hatai, 1899)
A. levis (Goto & Hatai, 1899)
A. rokugo (Beddard, 1892)
A. schizoporus (Goto & Hatai, 1898)
A. sieboldi lenzi (Michaelsen, 1899)
A. tappensis (Ohfuchi, 1935)
A. tokioensis (Beddard, 1892)
A. vittatus (Goto & Hatai, 1898)
A. yunoshimensis (Hatai, 1930)
A. hupiensis (Michaelsen, 1895)
A. illotus species-group
 A. 'illotus' (Gates, 1932)
 '*Pheretima*' *oyuensis* Ohfuchi, 1937
 Amynthas pusillus (Ohfuchi, 1956)
A. japonicus (Horst, 1883)
A. megascolidioides (Goto & Hatai, 1899)
A. micronarius (Goto & Hatai, 1898)
A. minimus (Horst, 1893)
A. morrisi (Beddard, 1892)
A. obscurus (Goto & Hatai, 1898)
A. papulosus (Rosa, 1896)
A. parvicystis (Goto & Hatai, 1899)
A. robustus (Perrier, 1872)
A. scholasticus (Goto & Hatai, 1898)
Metaphire californica (Kinberg, 1867)
M. fuscata (Goto & Hatai, 1898)
M. hataii (Ohfuchi, 1937)
M. parvula (Ohfuchi, 1956)
M. peguana (Rosa, 1890)
M. riukiensis (Ohfuchi, 1957)
M. schmardae (Horst, 1883)
M. servina (Hatai & Ohfuchi, 1937)
M. sieboldi (Horst, 1883)
M. tosaensis (Ohfuchi, 1938)
M. yamardai (Hatai, 1930)
M. yezoensis (Kobayashi, 1938)
Pheretima (*Parapheretima*) *koellikeri* Michaelsen, 1928
Pithemera bicincta (Perrier, 1875)
Polypheretima elongata (Perrier, 1872)
P. iizukai (Goto & Hatai, 1899)

Taxonomy

Key to the genera of earthworms recorded from Japan

- | | | |
|---|---|---|
| 1 | Male pores in front of or at anterior margin of clitellum (Intestinal gizzards usually present) | 2 |
| | Male pores behind or at posterior margin of clitellum (Intestinal gizzards absent) | 3 |
| 2 | Male pores on segment 10 or in furrow 10/11 (First of several intestinal gizzard in or before segment 13) | <i>DRAWIDA</i> (family Moniligastridae) |
| | Male pores on segment 13* (Intestinal gizzards absent) | <i>BIWADRILUS</i> (family Biwadrilidae) |

*The species *Eiseniella tetraedra* (Lumbricidae) may be confused with *Biwadrilus* since it has male pores on segment 13. Although it is a widespread peregrine species it has not yet been recorded from Japan. It may be distinguished from *Biwadrilus* by its more posteriorly placed clitellum (segments 22–37) and the possession of an intestinal gizzard and calciferous glands.

Male pores on segment 15 (A single intestinal gizzard in segments 17

or 17-18. *APORRECTODEA*, *BIMASTOS*, *DENDROBAENA*, *DENDRODRILUS*,
EISENIA and *LUMBRICUS* (family Lumbricidae)

- | | |
|---|---|
| 3(1) Setae, 8 on each segment | 4 |
| Setae, more than 20 on each segment | <i>PHERETIMA</i> group of genera (family
Megascolecidae) |
| 4 Calciferous glands present | 5 |
| Calciferous glands absent | 6 |
| 5 Calciferous glands in segment 9 or 9 and 10 | <i>OCNERODRILUS</i> (family Ocneroдрilidae) |
| Calciferous glands in segments 15, 16 and 17 | <i>DICHOGASTER</i> (family Octochaetidae) |
| 6(4) Male pores on segment 17 | <i>MICROSCOLEX</i> (family Acanthodrilidae) |
| Male pores on segment 18 | <i>PONTODRILUS</i> family Acanthodrilidae) |

Family MONILIGASTRIDAE

DRAWIDA Michaelsen, 1900

DIAGNOSIS. Setae lumbricine. Dorsal pores absent. Clitellum includes segments 10-13. Male pores in or near intersegmental furrow 10/11. Prostates absent. Oesophageal gizzards, calciferous glands and intestinal caeca absent. Several intestinal gizzards in segments 12-27. Excretory system holonephric.

INDIGENOUS DISTRIBUTION. Japan, Korea, Manchuria, Siberia, China, India, ?Ceylon, Burma, Thailand, Indo-China, Malaya, Philippines, Borneo.

REMARKS. Eight species of *Drawida* have been recorded from Japan. All are either restricted to Japan or also occur in Korea. [*D. japonica* has been recorded from outside the Japan/Korea area but Gates (1935: 3) is of the opinion that these records represent another species.]

Oishi (1932: 18) listed five new species of *Drawida* but omitted to characterize them. A survey of the literature failed to reveal any subsequent descriptions so they are *nomina nuda* which are therefore outside of nomenclature.

None of the eight species considered here is particularly well known and the specific status of each requires closer investigation. Since this appraisal would require consideration of their affinities with non-Japanese species, a project beyond the scope of the present work, only the principal morphological characters of these species are tabulated (Table 1).

Drawida hattamimizu Hatai, 1930

hattamimizu Hatai, 1930*a*: 485. Other Japanese records: Ohfuchi, 1938*d*: 1993; Kobayashi, 1941*b*: 263.

JAPANESE RECORDS. **Hokkaido**, ISHIKAI (Ohfuchi, 1938). **Honshu (Chūbu-Chihō)** (Kobayashi, 1941*b*), ISHIKAWA-KEN Hatta & Kanazawa (Hatai, 1930): (**Kinki-Chihō**) (Kobayashi, 1941*b*).

DISTRIBUTION. Japan.

Drawida japonica Michaelsen, 1892

japonica Michaelsen, 1892 : 232. Other Japanese records: Kobayashi, 1941*b* : 263,*d*: 458,*e*: 515.

JAPANESE RECORDS. 'Japan' (Michaelsen, 1892). **Honshu (Kantō-Chihō)** (Kobayashi, 1941*b*); TOCHII-KEN Utsunomiya (Kobayashi, 1941*d*): (**Chūbu-Chihō**) (Kobayashi, 1941*b*): (**Kinki-Chihō**) (Kobayashi, 1941*b*): (**Chūgoku-Chihō**) (Kobayashi, 1941*b*). **Shikoku** (Kobayashi, 1941*b*). **Kyushu** (Kobayashi, 1941*b* & *e*); NAGASAKI-KEN Iki (Kobayashi, 1941*b*).

DISTRIBUTION. Japan and Korea.

Table 1 *Drawida*: marker characters of Japanese species

Characters	<i>moriokaensis</i>	<i>japonica</i>	<i>koreana</i>	<i>keikiensis</i>	<i>nemora</i>	<i>ofunatoensis</i>	<i>tairaensis</i>	<i>hattamimizu</i>
Number of gizzards	2-3	2-3	2-3	3-4	3-5	4 or more	4	6-9
Segments with gizzards	10-13	12-13, 14	12-13, 14	12, 13-15	12, 13-15, 16	12-17, 18	13-19	13-19
Position of male pores	furrow 10/11	?	segment 10	furrow 10/11	furrow 10/11	furrow 10/11	furrow 10/11	furrow 10/11
Form of male pore	penis in copulatory pouch	porophore	porophore	penis in copulatory pouch	penis in copulatory pouch	penis in copulatory pouch	penis in copulatory pouch	?
Genital markings	-	vii-lx, occ. xii & xiii	vii-xii	-	vi-xiii	vii-xiii	viii	vi-xiii
Length (mm)	65-100	32-93	63-100	40-54	65-120	228-283	60-93	c. 246
Colour	dark lead grey; white ventrally	-	dark blue/ dark reddish blue	yellowish grey	dark blue; yellow grey ventrally	dark yellow; yellowish grey ventrally	fleshy red; white ventrally	?

In addition to the characters given above, the species *hattamimizu* is distinctive in having a clitellum extending from segment 9-15, occasionally 16 (other species segments 10-13) and spermathecal pores slightly ventral to *d* (other species *c* or median to *c*).

Drawida keikiensis Kobayashi, 1938

keikiensis Kobayashi, 1938a : 107. Japanese records: Kobayashi, 1941b : 263.

JAPANESE RECORDS. **Honshu (Chūbu-Chihō)** (Kobayashi, 1941b): (**Kinki-Chihō**) (Kobayashi, 1941b): (**Chūgoku-Chihō**) (Kobayashi, 1941b). **Shikoku** (Kobayashi, 1941b). **Kyushu** (Kobayashi, 1941b).

DISTRIBUTION. Japan and Korea.

Drawida koreana Kobayashi, 1938

koreana Kobayashi, 1938a : 102. Japanese records: Kobayashi, 1941e : 515.

JAPANESE RECORDS. **Kyushu** (Kobayashi, 1941e).

DISTRIBUTION. Japan and Korea.

Drawida moriokaensis Ohfuchi, 1938

moriokaensis Ohfuchi, 1938b : 44.

JAPANESE RECORDS. **Honshu (Ōu-Chihō)** IWATE-KEN Morioka (Ohfuchi, 1938); MIYAGI-KEN Tsukinoki (Ohfuchi, 1938).

DISTRIBUTION. Japan.

Drawida nemora Kobayashi, 1936

nemora Kobayashi, 1936 : 141. Japanese records: Kobayashi, 1941b : 263.

JAPANESE RECORDS. **Honshu (Chūbu-Chihō)** (Kobayashi, 1941b).

DISTRIBUTION. Japan and Korea.

Drawida ofunatoensis Ohfuchi, 1938

ofunatoensis Ohfuchi, 1938b : 33.

JAPANESE RECORDS. **Honshu (Ōu-Chihō)** IWATE-KEN coast & islands of Sanriku (Ohfuchi, 1938b); MIYAGI-KEN some regions of coast (Ohfuchi, 1938b).

DISTRIBUTION. Japan.

Drawida tairaensis Ohfuchi, 1938

tairaensis Ohfuchi, 1938b : 39.

JAPANESE RECORDS. **Honshu (Ōu-Chihō)** AKITA-KEN Honjō (Ohfuchi, 1938b); IWATE-KEN Morioka (Ohfuchi, 1938b); MIYAGI-KEN Tsukinoki (Ohfuchi, 1938b); FUKUSHIMA-KEN Taira machi (Ohfuchi, 1938b).

DISTRIBUTION. Japan.

Family BIWADRILIDAE

BIWADRILUS Jamieson, 1971

DIAGNOSIS. Setae lumbricine. Dorsal pores absent. Clitellum includes segments 15–31. Prostates absent. Male pores on segment 13. Oesophageal gizzards, intestinal gizzards, calciferous glands and intestinal caeca absent. Excretory system holonephric.

INDIGENOUS RANGE: Japan.

Biwadrilus bathybates (Stephenson, 1917)

Criodrillus bathybates Stephenson, 1917 : 96. Other Japanese records: (syn. *miyashitai*) Yamaguchi, 1953 : 309.

C. miyashitai Nagase & Nomura, 1937 : 361.

DIAGNOSIS. As for the genus.

JAPANESE RECORDS. **Honshu (Ōu-Chihō)** YAMAGATA-KEN Tsuruoka (Nagase & Nomura, 1937); (**Chūbu-Chihō**) KYOTO-KEN Biwa-ko (Stephenson, 1917; Yamaguchi, 1953); KYOTO-FU Komori (Nagase & Nomura, 1937); OSAKA-FU Minamitoyoshima (Yamaguchi, 1953); (**Kinki-Chihō**) HYOGO-KEN Muko (Yamaguchi, 1953).

DISTRIBUTION. Japan.

Family LUMBRICIDAE

DIAGNOSIS. Setae lumbricine. Dorsal pores present. Clitellum usually begins behind segment 22, rarely (*Eiseniella*) segment 15. Male pores usually on segment 15, rarely (*Eiseniella*) segments 12, 13 or 14. Prostates, oesophageal gizzards and intestinal caeca absent. A single intestinal gizzard in segment 17 or 17 and 18. Excretory system holonephric.

INDIGENOUS RANGE. Palaearctic and eastern North America.

REMARKS. The currently recognized Lumbricid genera are defined principally on difficult to observe somatic structures. Since the Japanese species can be readily identified without recourse to these characters, generic diagnoses are not provided.

Of the eight Lumbricid species recorded from Japan, seven are widespread allochthonous forms which may have been introduced into Japan through the agency of man. Only one species, *Eisenia japonica* is thought to be indigenous but even this species has been recorded in Europe (Graff, 1954). Full descriptions and distributions of the allochthonous species were provided by Gates (1972a). For a detailed description of *E. japonica* see Gates (1975).

The names *Bimastos*, *E. fetida* were emended to *Bimastus* and *E. foetida* respectively by Michaelsen (1900) and used by many subsequent authors. Under the articles of the International Code of Zoological Nomenclature such emendations are invalid and the original orthography is employed here.

Several recent revisions of the family Lumbricidae (Omodeo, 1956; Bouché, 1972, Perel, 1976) include taxonomic changes which effect the Japanese fauna. The genus *Allolobophora* has been restricted to include only the type species (*A. chlorotica*); excluded species being accommodated in either *Eisenia* or *Aporrectodea* (syn. *Nicodrillus* Bouché). The species *Bimastos tenuis* has been placed within the synonymy of *rubida* which itself has been transferred from *Dendrobaena* to *Dendrodrilus*.

Some of the results of these revisions are incompatible with one another and with the results of other workers. Often a species is consigned to different genera by different workers. Of the Japanese species, *rosea* is included in *Eisenia* for convenience although Perel (1974) excluded it from this genus but did not indicate to which genus it should be assigned.

Key to the species of Lumbricidae of Japan

1	Prostomium tanylobic	<i>Lumbricus</i>
	Prostomium epilobic	2
2	Setae closely paired ($aa = 3ab$)	3
	Setae widely paired ($aa = 1 - 2ab$)	4
3	Tubercula pubertatis on segments 24, 25, 26-30 or absent	<i>Bimastos parvus</i>
	Tubercula pubertatis on segments 27-29	<i>Eisenia japonica</i>
	Tubercula pubertatis on segments 28-30, 31	<i>Eisenia fetida</i>
	Tubercula pubertatis on segments 29, 30-31	<i>Eisenia rosea</i>
	Tubercula pubertatis on segments 31-33	<i>Aporrectodea trapezoides</i> species-complex

- 4(2) Tubercula pubertatis on segments 28, 29–30, 31 (tail cylindrical) . . . *Dendrodrilus rubidus*
 Tubercula pubertatis on segments 31–33 (tail octagonal) . . . *Dendrobaena octaedra*

Aporrectodea trapezoides species-complex

trapezoides species-group, Gates, 1972*b* : 1.

DIAGNOSIS. Length 60–140 mm. Body cylindrical or flattened posteriorly to form rectangular cross section with setal pairs at corners. Prostomium epilobic. Clitellum on segments 27, 28, 29–33, 34, 35. Tubercula pubertatis on segments 31–33. Male pores on segment 15. Spermathecal pores in furrows 9/10/11 in setal line *c*. First dorsal pore in a furrow between 6/7 and 13/14. Setae closely paired, setal ratio (*caliginosa*) $30aa = 10ab = 20bc = 7cd = 100dd$.

REMARKS. The close affinities of the component taxa of this complex were first recognized by Gates (1972*b*) when he erected the species-complex to accommodate *caliginosa* Savigny, 1826 (under the name *turgida* Eisen, 1873), *trapezoides* Duges, 1828 and six other species.

Aporrectodea caliginosa (Savigny, 1826)

caliginosa Savigny, 1826 : 180. Japanese records: Kobayashi, 1941*a* : 52, *b* : 264, *c* : 378, *e* : 515; Nakamura, 1967 : 164; Nakamura, 1972 : 18; Nakamura, 1973*a* : 199, *b* : 210.

DIAGNOSIS. Length 60–85 mm. Body cylindrical, unpigmented, anterior segments flesh pink, rest of body pale grey. Clitellum on segments 27, 28, 29–34, 35. Genital tumescences incorporating setae *a* and *b* on segments 9–11, 30, 32–34 and frequently 27. First dorsal pore in furrow 12/13 or 13/14.

JAPANESE RECORDS. **Hokkaido** (Nakamura, 1972); **ISHIKAI Sapporo** (Nakamura, 1967; 1973*a* & *b*). **Honshu (Ōu-Chihō)** (Kobayashi, 1941*c*): (**Chūbu-Chihō**) (Kobayashi, 1941*b* & *c*): (**Kinki-Chihō**) (Kobayashi, 1941*b* & *c*): (**Chūgoku-Chihō**) (Kobayashi, 1941*b* & *c*); **SHIMANE-KEN Oki-guntō** (Kobayashi, 1941*a*). **Shikoku** (Kobayashi, 1941*b* & *c*). **Kyushu** (Kobayashi, 1941*b*, *c* & *e*); **KAGOSHIMA-KEN Shibushi & Yanakawa** (Kobayashi, 1941*c*).

DISTRIBUTION. Cosmopolitan (indigenous to Palaearctic).

Aporrectodea trapezoides (Duges, 1828)

trapezoides Duges, 1828 : 289. Japanese records: Michaelsen, 1892 : 230; Kobayashi, 1938*b* : 414; Kobayashi, 1941*b* : 264, *d* : 459, *e* : 515.

DIAGNOSIS. Length 80–140 mm. Body flattened posteriorly to form rectangular cross section with setal pairs at corners, slate, brown, reddish brown, often paler ventrally. Clitellum on segments 27, 28–33, 34. Genital tumescences incorporating setae *a* and *b* on segments 9–11, 32–34 often 27 and occasionally 26, 28, 29. First dorsal pore in a furrow between 6/7 and 13/14.

JAPANESE RECORDS. 'Japan' (Michaelsen, 1892). **Hokkaido** (Kobayashi, 1941*b* & *c*); **OSHIMA Hakodate** (Kobayashi, 1938*c*). **Honshu (Kantō-Chihō)** **TOCHU-KEN Utsunomiya** (Kobayashi, 1941*d*): (**Kinki-Chihō**) (Kobayashi, 1941*b*): (**Chūgoku-Chihō**) (Kobayashi, 1941*b*). **Shikoku** (Kobayashi, 1941*b*). **Tsushima** (Kobayashi, 1941*b*). **Kyushu** (Kobayashi, 1941*b* & *e*).

DISTRIBUTION. Palaearctic (indigenous), Nearctic, Oriental, Australasian and Neotropical regions.

Bimastos parvus Eisen, 1874

parvus Eisen, 1874 : 46. Japanese records: Michaelsen, 1910 : 64; Kobayashi, 1941*a* : 52, *b* : 264, *c* : 378, *e* : 515; Yamaguchi, 1953 : 310; Gates, 1972*a* : 87.
beddardi Michaelsen, 1894 : 182. Japanese records: Kobayashi, 1941*b* : 264, *e* : 515.

DIAGNOSIS. Length 17–65 mm. Body cylindrical, reddish dorsally, yellow ventrally. Prostomium epilobic. Clitellum on segments 23, 24, 25–31, 32. Tubercula pubertatis absent or in the form of indistinct paired longitudinal ridges along the ventral margins of the clitellum on segments 24, 25, 26–30. Male pores on segment 15. Spermathecal pores absent. First dorsal pore in furrow 5/6. Setae closely paired, setal ratio (postclitellar segments) $30aa = 10ab = 25bc = 9cd = 100dd$.

JAPANESE RECORDS. 'Japan' (Michaelsen, 1910—intercepted at Hamburg; Gates, 1972—intercepted at American port). **Hokkaido** (Kobayashi, 1941c); **SHIKAI** Chitose (Yamaguchi, 1953). **Honshu (Ōu-Chihō)** (Kobayashi, 1941b); **(Chūbu-Chihō)** (Kobayashi, 1941b & c); **(Kinki-Chihō)** (Kobayashi, 1941b & c); **(Chūgoku-Chihō)** (Kobayashi, 1941b & c); **SHIMANE-KEN** Oki-guntō (Kobayashi, 1941a & b). **Shikoku** (Kobayashi, 1941b & c). **Tsushima** (Kobayashi, 1941b). **Kyushu** (Kobayashi, 1941b, c & e); **NAGASAKI-KEN** Gottōrettō & Iki (Kobayashi, 1941b); **KAGOSHIMA-KEN** Kagoshima & Shibushi (Kobayashi, 1941c).

DISTRIBUTION. Cosmopolitan (indigenous to eastern North America).

Dendrobaena octaedra (Savigny, 1826)

octaedra Savigny, 1826 : 183; Gates, 1974a : 15. Japanese records: Nakamura, 1967 : 164; Stöp-Bowitz, 1969 : 214; Tamura et al, 1969 : 26; Nakamura, 1972 : 18; Nakamura, 1973a : 199, b : 210.

DIAGNOSIS. Length 17–40 mm. Body cylindrical, octagonal posteriorly, red, yellowish, brown, violet or copper coloured. Prostomium epilobic. Clitellum on segments 27, 28, 29–33, 34. Tubercula pubertatis in form of a longitudinal ridge on segments 31–33. Male pores on segment 15. Spermathecal pores in furrows 9/10/11/12 at seta *d*. First dorsal pore in a furrow between 4/5 and 6/7. Setae widely paired, $aa = ab = bc = cd$, *dd* slightly greater than *aa*.

JAPANESE RECORDS. **Hokkaido** Stöp-Bowitz, 1969; Nakamura 1972); **SHIKAI** Sapporo (Nakamura, 1967; 1973a & b); **HIDAKA** Hidaka-Mombetsu (Tamura et al, 1969).

DISTRIBUTION. Palaearctic (indigenous), Nearctic and Oriental regions.

Dendrodrilus rubidus (Savigny, 1826)

rubida Savigny, 1826 : 182.

tenuis Eisen, 1874 : 44. Japanese records: Kobayashi, 1938b : 415; Kobayashi, 1941b : 264; Stöp-Bowitz, 1969 : 227; Tamura et al, 1969 : 26; Nakamura, 1972 : 18; Nakamura, 1973a : 199, b : 210.

DIAGNOSIS. Length 20–90 mm. Body cylindrical, dark red dorsally, pale ventrally and dorsally in the intersegmental furrows. Prostomium epilobic. Clitellum on segments 24, 25, 26, 27–31, 32. Tubercula pubertatis absent or in the form of indistinct paired longitudinal ridges on segments 28, 29–30, 31. Male pores on segment 15. Spermathecal pores absent or in furrows 9/10/11 in setal line *c*. First dorsal pore in furrow 4/5 or 5/6. Setae widely paired, $18aa = 10ab = 24bc = 12cd = 50dd$.

JAPANESE RECORDS. **Hokkaido** (Kobayashi, 1941b; Stöp-Bowitz, 1969; Nakamura, 1972); **SHIKAI** Sapporo (Nakamura, 1973a & b); **HIDAKA** Hidaka-Mombetsu (Tamura et al, 1969); **OSHIMA** Hakodate & Nanayehama (Kobayashi, 1938c). **Honshu (Chūbu-Chihō)** (Kobayashi, 1941b); **(Chūgoku-Chihō)** (Kobayashi, 1941b).

DISTRIBUTION. Cosmopolitan (indigenous to Palaearctic).

Eisenia fetida (Savigny, 1826)

fetida Savigny, 1826 : 182. Japanese records: Michaelsen, 1892 : 230; Sasaki, 1924 : 89; Kobayashi, 1928 : 468; Kobayashi, 1938b : 415; Ohfuchi, 1938d : 1992; Kobayashi, 1941b : 263, c : 378, d : 459, e : 515; Stöp-Bowitz, 1969 : 210; Nakamura, 1972 : 18; Nakamura, 1973a : 199, b : 210.

DIAGNOSIS. Length 35–130 mm. Body cylindrical, reddish purple or brown dorsally, yellow in intersegmental furrows and ventrally. Prostomium epilobic. Clitellum on segments 24, 25, 26–32. Tubercula pubertatis in the form of paired longitudinal ridges on segments 28–30, 31. Male pores on segment 15. Spermathecal pores in furrows 9/10/11, near the dorsal line. First dorsal pores in furrow 5/6. Setae closely paired, $4aa = ab = 4bc = cd = 16dd$.

JAPANESE RECORDS. 'Japan' (Michaelsen, 1892). **Hokkaido** (Kobayashi, 1941*b* & *c*; Stöp-Bowitz, 1969; Nakamura, 1972); **ISHIKAI** (Ohfuchi, 1938) Sapporo (Nakamura, 1973*a* & *b*); **OSHIMA** Hakodate (Kobayashi, 1938*c*). **Honshu (Ōu-Chihō)** (Kobayashi, 1941*b* & *c*); **AOMORI-KEN** Aomori (Sasaki, 1924); **IWATE-KEN** Morioka (Sasaki, 1924); **MIYAGI-KEN** Sendai (Sasaki, 1924; Kobayashi, 1928); (**Kantō-Chihō**) (Kobayashi, 1941*b*); **TOCHII-KEN** Utsunomiya (Kobayashi, 1941*d*); **TŌKYŌ-TO** Tokyo (Sasaki, 1924); (**Chūbu-Chihō**) (Kobayashi, 1941*b* & *c*); (**Kinki-Chihō**) (Kobayashi, 1941*b* & *c*); (**Chūgoku-Chihō**) (Kobayashi, 1941*b* & *c*). **Shikoku** (Kobayashi, 1941*b* & *c*). **Tsushima** (Kobayashi, 1941*b*). **Kyushu** (Kobayashi, 1941*b*, *c* & *e*); **NAGASAKI-KEN** Iki (Kobayashi, 1941*b*); **KAGOSHIMA-KEN** Kagoshima, Shibushi & Yanakawa (Kobayashi, 1941*c*). **Osumi-Guntō YAKU-SHIMA** (Kobayashi, 1941*b* & *c*).

DISTRIBUTION. Cosmopolitan (indigenous to Palaearctic)

Eisenia japonica (Michaelsen, 1892)

japonica Michaelsen, 1892 : 230. Other Japanese records: Michaelsen, 1900 : 481; Michaelsen, 1910 : 62; Kobayashi, 1938*b* : 414; Oishi, 1934 : 134; Kobayashi, 1941*a* : 52, *b* : 264, *c* : 378, *d* : 460, *e* : 515; Nakamura, 1967 : 164; Tamura et al, 1969 : 26; Nakamura, 1971 : 347; Nakamura, 1972 : 10; Nakamura, 1973*a* : 199, *b* : 210; Gates, 1975 : 1.

japonica f. *gigantica* Oishi, 1934 : 134. Other Japanese records: Kobayashi, 1941*b* : 264.

japonica f. *minuta* Oishi, 1934 : 134.

DIAGNOSIS. Length 24–175 mm. Body cylindrical, whitish grey or dark reddish brown. Prostomium epilobic. Clitellum on segments 23, 24–31. Tubercula pubertatis in the form of paired longitudinal ridges on segments 27–29, often disrupted and on segments 27 and 29 only. Male pores on segment 15. Spermathecal pores in furrows 9/10/11 in setal line *c*. First dorsal pore in furrow 4/5. Setae closely paired, setal ratio $93aa = 10ab = 46bc = 7cd = 310dd$.

REMARKS. Some authors (Beddard, 1895; Oishi, 1934; Kobayashi, 1941; Nakamura, 1972) have recognized varieties of this species. Their taxonomic validities are dubious nevertheless the diagnostic features tabulated by Kobayashi (1941*f*) are given below (Table 2).

JAPANESE RECORDS. **Hokkaido** (Kobayashi, 1941*b* & *c*; Nakamura, 1972); **ABASHIRI** Oketo (Nakamura, 1971); **KAMIKAWA** Furano & Mitsumata (Gates, 1975), Monomanai & Nishi-Shibetsu (Nakamura, 1971); **ISHIKAI** Misumai, near Sapporo (Nakamura, 1973*a*), Sapporo (Nakamura, 1967, 1973*a* & *b*); **HIDAKA** Hidaka-Mombetsu (Tamura et al, 1969); **SHIRIBESHI** Kutchan & Yotei-zan (Gates, 1975); **OSHIMA** Hakodate (Michaelsen, 1892); Nanayehama & Hakodate (Kobayashi, 1938*c*). **Honshu (Ōu-Chihō)** (Kobayashi, 1941*b* & *c*); (**Kantō-Chihō**) (Kobayashi, 1941*b*); **TOCHII-KEN** Utsunomiya (Kobayashi, 1941*d*); **KANAGAWA-KEN** Eno-shima (Michaelsen, 1892*; Rosa, 1893); Yokohama (Michaelsen, 1910); (**Chūbu-Chihō**) (Kobayashi, 1941*b* & *c*); **YAMANASHI-KEN** Fuji-san (Michaelsen, 1900); (**Kinki-Chihō**) (Kobayashi, 1941*b* & *c*); (**Chūgoku-Chihō**) (Kobayashi, 1941*b* & *c*); **SHIMANE-KEN** Oki-guntō (Kobayashi, 1941*a* & *b*). **Shikoku** (Kobayashi, 1941*b* & *c*). **Tsushima** (Kobayashi, 1941*b*). **Kyushu** (Kobayashi, 1941*b*, *c* & *e*); **FUKUOKA-KEN** Moji (Michaelsen, 1910); **NAGASAKI-KEN** Iki (Kobayashi, 1941*b*); **MIYAZAKI-KEN** Aoi-dake (Kobayashi, 1941*c*); **KAGOSHIMA-KEN** Kagoshima (Kobayashi, 1941*c*).

DISTRIBUTION. Palaearctic (Japan, Korea and Europe).

*Michaelsen's original reference to this record was 'Enoshima, Japan'. It is uncertain which of the localities named Enoshima was referred to but Rosa (1893) noted that it was near Tokyo.

Table 2 *Eisenia japonica*: marker characters of varieties. (After Kobayashi, 1941f)

	<i>minuta</i>	<i>typica</i>	<i>gigantica</i>
Length (mm)	24-55	42-102	139-175
Diameter (mm)	1.75-2.80	2.5-5.0	3.5-7.2
Segment number	85-110	96-140	125-151
Colour	uniformly whitish grey	anterior pink, posterior whitish grey	dark reddish brown
Shape of tubercula pubertatis	round	triangular	intermediate
Size of seta (μ)	290 x 24	390 x 36	540 x 47

***Eisenia rosea* Savigny, 1826)**

rosea Savigny, 1826 : 182; Gates, 1974*b* : 9. Japanese records: Nakamura, 1971 : 347; Nakamura, 1972 : 18; Nakamura, 1973*a* : 199, *b* : 210.

DIAGNOSIS. Length 25-85 mm. Body cylindrical, unpigmented, anterior segments dark red, rest of body pink or pinkish grey. Prostomium epilobic. Clitellum on segments 24, 25, 26-32, 33. Tubercula pubertatis on segments 29-30, 31. Male pores on segment 15. Spermathecal pores in furrows 9/10/11, near dorsal line or halfway between lateral line and setal line *d*. First dorsal pore in furrow 4/5. Setae closely paired, *aa* greater than *bc*, *ab* greater than *cd*, *dd* = 1/3-1/2 body circumference.

JAPANESE RECORDS. **Hokkaido** (Nakamura, 1972); **KAMIKAWA** Monomanai & Nishi-Shibetsu (Nakamura, 1971); **ISHIKAI** Hiroshima (Nakamura, 1973*a*); **Sapporo** (Nakamura, 1973*b*).

DISTRIBUTION. Cosmopolitan (indigenous to Palaearctic)

***LUMBRICUS* Linnaeus, 1758**

Lumbricus sp. Ohfuchi, 1941 : 255.

DIAGNOSIS. Length 20-300 mm. Body cylindrical, trapezoidal posteriorly, purplish red or purplish brown dorsally, paler ventrally. Prostomium prolobic. Clitellum begins between segment 26 and 39 and occupies 5-15 segments. Tubercula pubertatis usually occupies more than 4 clitellar segments. Male pores on segment 15. Spermathecal pores in furrows 9/10/11 between setae *c* and *d*. First dorsal pore between furrows 5/6 and 9/10. Setae closely paired.

JAPANESE RECORDS. **Honshu (Chūgoku-Chihō)** YAMAGUCHI-KEN Shuhodo Akigoshi (Ohfuchi, 1941).

DISTRIBUTION. Cosmopolitan (indigenous to Holarctic).

Family OCNERODRILIDAE***OCNERODRILUS* Eisen, 1878**

DIAGNOSIS. Setae lumbricine. Dorsal pores absent. Clitellum includes segments 14-19. Prostates tubular, discharging through combined male and prostatic pores on segment 17. Oesophageal and intestinal gizzards absent. Calciferous glands in segment 9 or segments 9 and 10. Intestinal caeca absent. Excretory system holonephric.

INDIGENOUS RANGE. Tropical and subtropical America, tropical Africa. Several species are allochthonous, one, *O. occidentalis* Eisen, 1878 has been recorded from Japan.

Ocnerodrilus occidentalis Eisen, 1878

occidentalis Eisen, 1878 : 10. Japanese records: Kobayashi, 1941*a* : 52, *b* : 263, *c* : 378, *e* : 515; Gates, 1973 : 16.

DIAGNOSIS. As for the genus.

JAPANESE RECORDS. 'Japan' (Gates, 1973 interception at American port). **Honshu** (Kantō-Chihō) KANAGAWA-KEN Ō-shima (Kobayashi, 1941*b* & *c*): (Chūbu-Chihō) (Kobayashi, 1941*b* & *c*): (Kinki-Chihō) (Kobayashi, 1941*b* & *c*): (Chūgoku-Chihō) (Kobayashi, 1941*b* & *c*); SHIMANE-KEN Oki-guntō (Kobayashi, 1941*a* & *b*). **Shikoku** (Kobayashi, 1941*b* & *c*). **Kyushu** (Kobayashi, 1941*b, c* & *e*); NAGASAKI-KEN Gottō-rettō (Kobayashi, 1941*b*); KAGOSHIMA-KEN Kagoshima & Yanakawa (Kobayashi, 1941*c*). **Okinawa-guntō** OKINAWA-JIMA (Kobayashi, 1941*b* & *c*).

DISTRIBUTION. Palaearctic, Nearctic, Oriental and Ethiopian regions.

Family ACANTHODRILIDAE

MICROSCOLEX Rosa, 1887

DIAGNOSIS: Setae lumbricine. Dorsal pores absent. Clitellum includes segments 14–16. Prostates tubular, discharging near male pores on segment 17. A weak oesophageal gizzard in segment 5. Calciferous glands, intestinal caeca and intestinal gizzards absent. Excretory system holonephric.

INDIGENOUS RANGE. Southern South America, South Africa, Sub-Antarctic Islands. Two species, *M. dubius* (Fletcher, 1887) and *M. phosphoreus* (Dugès, 1837) are allochthonous, the latter has been recorded from Japan.

Microscolex phosphoreus (Dugès, 1837)

phosphoreus Dugès, 1837 : 17. Japanese records: Yamaguchi, 1935 : 200; Kobayashi, 1941*b* : 263.

DIAGNOSIS. As for the genus.

JAPANESE RECORDS. **Honshu** (Kantō-Chihō) (Kobayashi, 1941*b*): (Chūgoku-Chihō) (Kobayashi 1941*b*). **Shikoku** (Kobayashi, 1941*b*). **Kyushu** KAGOSHIMA-KEN Ōsio (Yamaguchi, 1935).

DISTRIBUTION. Cosmopolitan (? indigenous in South America).

PONTODRILUS Perrier, 1874

DIAGNOSIS. Setae lumbricine. Dorsal pores absent. Clitellum begins on segment 14 and occupies 5 or 6 segments. Prostates tubular discharging through combined male and prostatic pores on segment 18. Oesophageal gizzard rudimentary or absent. Calciferous glands, intestinal caeca and intestinal gizzards absent. Excretory system holonephric.

DISTRIBUTION. Circum-mundane, on sea shores throughout the tropics and warmer areas of the temperate zones. A single species has been recorded from Japan.

Pontodrilus matsushimensis Iizuka, 1898

matsushimensis Iizuka, 1898 : 21. Other Japanese records: Yamaguchi, 1953 : 309.

DIAGNOSIS. As for the genus.

JAPANESE RECORDS. **Honshu** (Ōu-chihō) MIYAGI-KEN Matsushima-wan (Iizuka, 1898); Miyakojima (Yamaguchi, 1953): (Kinki-Chihō) HYOGO-KEN Akashi (Yamaguchi, 1953). **Kyushu** FUKUOKA-KEN Fukuoshima (Yamaguchi, 1953); 'shore of Ranshima near Ogura' (Yamaguchi, 1953).

DISTRIBUTION. Japan, New Caledonia (Beddard, 1899) and Chatham Island, New Zealand (as var. *chathamianus* Michaelsen, 1899).

Family OCTOCHAETIDAE

DICHOGASTER Beddard, 1888

DIAGNOSIS. Setae lumbricine. Dorsal pores present. Clitellum includes segments 14–18. Prostates tubular discharging on segments 17 and 19 or 17 only. Male pores on segment 18. Penial setae present. Two well developed oesophageal gizzards anterior to septum 8/9. Paired calciferous glands in segments 15, 16 and 17, intestinal caeca and gizzards absent. Excretory system meronephric.

INDIGENOUS RANGE. Tropical Americas, Africa. Several species are allochthonous of which two have been recorded from Japan.

Key to species recorded from Japan

- | | | |
|---|--|----------------|
| 1 | One pair of prostates which discharge onto segment 17 | <i>saliens</i> |
| | Two pairs of prostates which discharge onto segments 17 and 19 | <i>bolau</i> |

Dichogaster bolau Michaelsen, 1891

bolau Michaelsen, 1891a : 9. Japanese records: Kobayashi, 1941c : 379.

DIAGNOSIS. Length 20–40 mm. Two pairs of prostates discharging on segments 17 and 19.

JAPANESE RECORDS. **Okinawa-Guntō** OKINAWA-JIMA (Kobayashi, 1941c).

DISTRIBUTION. Cosmopolitan (indigenous range unknown).

Dichogaster saliens (Beddard, 1893)

saliens Beddard, 1893 : 683.

hatomaana Ohfuchi, 1957 : 259.

DIAGNOSIS. Length 17–70 mm. One pair of prostates discharging onto segment 17 only.

REMARKS. The description of *D. hatomaana* provided by Ohfuchi (1957) is indistinguishable from that of *saliens*.

JAPANESE RECORDS. **Sakishima-Guntō** IRIOMOTE-JIMA Hatoma-jima (Ohfuchi, 1957).

DISTRIBUTION. Cosmopolitan (indigenous range unknown).

Family MEGASCOLECIDAE

PHERETIMA group of genera

DIAGNOSIS. Setae perichaetine. Dorsal pores present. Clitellum including segments 14–16. Prostates racemose discharging through combined male and prostatic pores on segment 18 or rarely 19. Oesophageal gizzard single, well developed in segment 8. Calciferous glands absent. Intestinal caeca usually present. Excretory system meronephric.

INDIGENOUS RANGE. Japan, Korea, China, Burma (east of the Chinwin/Irrawaddy axis), Thailand, Vietnam, Malaysia, Indonesia, Philippines, Papua New Guinea, New Britain, New Hebrides, New Caledonia, northern Queensland, islands of the western Pacific (Easton, 1979).

REMARKS. Nine closely related genera comprising about 760 nominal species, are included in the *Pheretima* group of genera. Five have been recorded from Japan: *Amyntas* Kinberg, 1867; *Metaphire* Sims & Easton, 1972; *Pithemera* Sims & Easton, 1972; *Pheretima* Kinberg, 1867; and *Polypheretima* Michaelsen, 1934.

GENERIC DIAGNOSES

Polypheretima—Intestinal caeca absent.

Pithemera—One pair of intestinal caeca present originating in or near segment 22.

Amynthas—One pair of intestinal caeca present originating in or near segment 27; male pores superficial.

Metaphire—One pair of intestinal caeca present originating in or near segment 27; male pores in copulatory pouches; no nephridia present on spermathecal ducts.

Pheretima—One pair of intestinal caeca present originating in or near segment 27; male pores in copulatory pouches; nephridia present on spermathecal ducts.

For full generic descriptions and keys to nominal species and species-groups see Sims & Easton, 1972 (also Easton, 1979 for keys and descriptions of the species of *Polypheretima*).

Key to the species of Megascolecidae of Japan

1	Intestinal caeca absent	2
	Intestinal caeca present	3
2	Spermathecal pores absent or in furrows 5/6/7, 5/6 or 6/7; genital markings presetal	<i>Polypheretima elongata</i>
	Spermathecal pores in furrows 5/6/7/8/9; genital markings postsetal	<i>Polypheretima iizukaii</i>
3(1)	Intestinal caeca originate in segment 22	<i>Pithemera bicincta</i>
	Intestinal caeca originate in segments 25–27	4
4	Spermathecal pores absent	5
	Spermathecal pores present	6
5	Intestinal caeca simple	<i>Amynthas illotus</i> species-group
	Intestinal caeca manicate	<i>Amynthas hilgendorfi</i> species-complex (part)
6(4)	Spermathecal pores segmental	7
	Spermathecal pores intersegmental	9
7	Spermathecal pores presetal	<i>Amynthas parvicystis</i>
	Spermathecal pores postsetal	8
8	Spermathecal pores on segment 6	<i>Amynthas glabrus</i>
	Spermathecal pores on segments 6, 7 & 8	<i>Amynthas obscurus</i>
9(6)	First spermathecal pores in furrow 4/5	10
	First spermathecal pores in furrow 5/6	11
	First spermathecal pores in furrow 6/7	22
	First spermathecal pores in furrow 7/8	29
10	Four pairs of spermathecal pores; male pores on segment 18	<i>Amynthas scholasticus</i>
	Five pairs of spermathecal pores; male pores on segment 19	<i>Amynthas megascolidioides</i>
11(9)	One pair of spermathecal pores	<i>Amynthas minimus</i>
	Two pairs of spermathecal pores	<i>Amynthas morrisi</i>
	Three pairs of spermathecal pores	12
	Four pairs of spermathecal pores	17
12	Intestinal caeca simple	13
	Intestinal caeca manicate	16
13	Male pores superficial	14
	Male pores in copulatory pouches	<i>Metaphire yezoensis</i>
14	Male porophores small; genital markings present	15
	Male porophores large; genital markings absent	<i>Amynthas acinctus</i>

15	Genital markings in transverse rows (body length less than 80 mm)	<i>Amyntas papulosus</i>	
	Genital markings in clusters associated with male pores (body length up to 200 mm)	<i>Amyntas gracilis</i>	
16(12)	Male pores superficial or absent	<i>Amyntas hilgendorfi</i> species-complex (part)	
	Male pores in copulatory pouches	<i>Metaphire hataii</i>	
17(11)	Intestinal caeca simple		18
	Intestinal caeca manicate	<i>Amyntas habereri</i>	
18	Male pores superficial		19
	Male pores in copulatory pouches		20
	Male pores in seminal grooves	<i>Metaphire riukiensis</i> ¹ (part)	
19	Genital markings small, segmental	<i>Amyntas corticus</i>	
	Genital markings large, intersegmental	<i>Amyntas micronarius</i>	
20(18)	Genital markings present	<i>Metaphire fuscata</i>	
	Genital markings absent		21
21	Copulatory pouches restricted to segment 18	<i>Metaphire tosaensis</i>	
	Copulatory pouches extending onto segments 17 and 19	<i>Metaphire riukiensis</i> ¹ (part)	
22(9)	One thecal segment	<i>Amyntas hilgendorfi</i> species-complex (part)	
	Two thecal segments		23
	Three thecal segments		25
23	Male pores in seminal grooves	<i>Amyntas japonicus</i>	
	Male pores simple or absent	<i>Amyntas hilgendorfi</i> species-complex (part)	
	Male pores in copulatory pouches		24
24	Intestinal caeca simple	<i>Metaphire parvula</i>	
	Intestinal caeca manicate	<i>Pheretima koellikeri</i>	
25(22)	Intestinal caeca simple		26
	Intestinal caeca manicate		28
26	Male pores superficial		27
	Male pores in copulatory pouches	<i>Metaphire peguana</i>	
27	Genital markings segmental	<i>Amyntas flavescens</i>	
	Genital markings intersegmental at 17/18 and 18/19	<i>Amyntas hupiensis</i>	
28(25)	Genital markings paired, median to male pores	<i>Metaphire servina</i>	
	Genital markings numerous, within copulatory pouches	<i>Metaphire yamardai</i>	
	Genital markings absent	<i>Metaphire sieboldi</i>	
29(9)	One thecal segment	<i>Amyntas hilgendorfi</i> species-complex (part)	
	Two thecal segments		30
30	Male pores superficial; genital markings present	<i>Amyntas robustus</i>	
	Male pores in copulatory pouches; genital markings absent		31
31	Intestinal caeca simple	<i>Metaphire californica</i>	
	Intestinal caeca manicate	<i>Metaphire schmardae</i>	

Amyntas acinctus (Goto & Hatai, 1899)

acincta Goto & Hatai, 1899: 16. Other Japanese records: Yamaguchi, 1930*a*: 52; Ohfuchi, 1938*d*: 1933; Kobayashi, 1941*b*: 260; Yamaguchi, 1962*a*: 10.

?*phaselus* Hatai, 1930*b*: 659. Other Japanese records: Kobayashi, 1938*b*: 410; Kobayashi, 1941*b*: 260, *e*: 513; Yamaguchi, 1962*a*: 11.

?*maculosus* Hatai, 1930*b*: 661.

¹It is uncertain whether the male pores of *M. riukiensis* are in copulatory pouches or in seminal grooves. The species has been keyed out twice to allow for either condition.

?*kamitai* Kobayashi, 1934:5. Other Japanese records: Kobayashi, 1938*b*:411; Kobayashi, 1941*e*:513.

?*phaselus tamurai* Kobayashi, 1938*b*:411.

DIAGNOSIS. Spermathecal pores paired, ventrolateral in furrows 5/6/7/8. Male pores superficial, on large porophores on segment 18. Genital markings absent. Intestinal caeca simple, often with incised ventral and dorsal margins, originating in segment 27.

JAPANESE RECORDS. **Hokkaido** (Hatai, 1930*b*; Kobayashi, 1941*b*); ISHIKAI (Ohfuchi, 1938); Sapporo (Hatai, 1930*b*; Yamaguchi, 1930*a*); OSHIMA Fukushima (Yamaguchi, 1962); Hachimano-cho in Hakodate, Kameda, Matsukage-cho in Hakodate & Ōma (Yamaguchi, 1962*a*); Hakodate (Kobayashi, 1938*b*); HIYAMA Imagane (Yamaguchi, 1962*a*). **Honshu (Ōu-Chihō)** (Kobayashi, 1941*b*); AOMORI-KEN Aomori, Kominato, Moura, Yokohama & Yuno-shima (Hatai, 1930*b*); MIYAGI-KEN Sendai (Hatai, 1930*b*): (**Kantō-Chihō**) (Kobayashi, 1941*b*); TŌKYŌ-TO Tokyo (Goto & Hatai, 1899): (**Chūbu-Chihō**) (Kobayashi, 1941*b*): (**Kinki-Chihō**) (Kobayashi, 1941*b*): (**Chūgoku-Chihō**) (Kobayashi, 1941*b*). **Shikoku** (Hatai, 1930*b*; Kobayashi, 1941*b*). **Kyushu** (Kobayashi, 1941*b*); NAGASAKI-KEN Iki (Kobayashi, 1941*b*).

DISTRIBUTION. Japan and Korea.

Amyntas corticus (Kinberg, 1867)

corticus Kinberg, 1867:102.

diffringens Baird, 1869:40; (syn. *divergens*, *heterochaeta*, *heteropoda*, *indica*, *nipponica*, *oyamai*, *tajaroensis*, *?toriii*) Gates, 1972*c*:18. Japanese records: Gates, 1938:209; Kobayashi, 1941*a*:51, *b*:261, *c*:378, *d*:458, *e*:513.

indica Horst, 1883:186. Japanese records: Michaelsen, 1892:241.

heterochaeta Michaelsen, 1891*b*:6. Japanese records: Ohfuchi, 1957:251.

?*jijimae* Rosa, 1891:402.

divergens Michaelsen, 1892:243. Other Japanese records: Ohfuchi, 1937*b*:67; Ohfuchi, 1938*d*:1993; Kobayashi, 1938*b*:405; Kobayashi, 1941*b*:260, *d*:459, *e*:513; Ohfuchi, 1941:252; Yamaguchi, 1962*a*:5.

nipponica Beddard, 1892*b*:760. Other Japanese records: Ohfuchi, 1937*b*:109.

heteropoda Goto & Hatai, 1898:69. Other Japanese records: Ohfuchi, 1937*b*:42, 138.

?*marenzelleri* Cognetti, 1906:780. Other Japanese records: Kobayashi, 1938*b*:407; Yamaguchi, 1962*a*:3.

oyamai Ohfuchi, 1937*b*:62. Other Japanese records: Kobayashi, 1938*b*:409; Yamaguchi, 1962*a*:4.

tajiroensis Ohfuchi, 1938*b*:46.

toriii Ohfuchi, 1941:244.

?*hatomajimensis* Ohfuchi, 1957:245.

DIAGNOSIS. Spermathecal pores paired, about 0.3 body circumference apart, in furrows 5/6/7/8/9. Male pores superficial on small porophores on segment 18. Genital markings small numerous on pre and post clitellar segments. Intestinal caeca simple with smooth margins, originating in segment 27.

JAPANESE RECORDS. 'Japan' (Rosa, 1891; Michaelsen, 1892; Beddard, 1892). **Hokkaido** (Kobayashi, 1941*b*); ISHIKAI (Ohfuchi, 1938); OSHIMA, Hakodate and Nanayehama (Kobayashi, 1938*c*); Fukushima, Gobanzakai, Hachimano-cho & Matsukage-cho in Hakodate, Hakodate, Kameda, Ōma & Yakumo (Yamaguchi, 1962). **Honshu (Ōu-Chihō)** (Kobayashi, 1941*b* & *c*); AKITA-KEN Ōdate (Ohfuchi, 1937*b*); IWATE-KEN Morioka (Ohfuchi, 1937*b*); YAMAGATA-KEN Fukuura & Nezugaseki (Ohfuchi, 1937*b*); MIYAGI-KEN Sendai, Tajiri and Tō-katta (Ohfuchi, 1937*b*); FUKUSHIMA-KEN Inawashiro, Kaneyama, Kitakata, Mikami, Taira, Tanagura, Tokusawa, Wakamatsu, Yashiro & Yashirogawa (Ohfuchi, 1937*b*): (**Kantō-Chihō**) (Kobayashi, 1941*b*); TOCHII-KEN Utsunomiya (Kobayashi, 1941*d*); IBARAKI-KEN Hirakata (Ohfuchi, 1937*a*) Mito (Ohfuchi, 1937*b*); SAITAMA-KEN Tokorozawa (Goto & Hatai, 1898); TŌKYŌ-TO Komaba (Ohfuchi, 1937*b*); Tokyo (Goto & Hatai, 1898; Gates, 1938); KANAGAWA-KEN Izumitsu on Ō-shima & Odawara (Ohfuchi, 1937*b*);

Kamakura (Goto & Hatai, 1898); Ō-shima (Kobayashi, 1941*b* & *c*); Yokohama (Cognetti, 1906); (**Chūbu-Chihō**) (Kobayashi, 1941*b* & *c*); SHIZUOKA-KEN Hamana Kō (Ohfuchi, 1937*b*); (**Kinki-Chihō**) (Kobayashi, 1941*b* & *c*); (**Chūgoku-Chihō**) (Kobayashi, 1941*b* & *c*); SHIMANE-KEN Oki-guntō (Kobayashi, 1941*a* & *b*). **Shikoku** (Kobayashi, 1941*b* & *c*); EHIME-KEN Matsuyama (Ohfuchi, 1937*b*); KOCHI-KEN Kōchi (Ohfuchi, 1937*b*); Mt Sampōzan (Ohfuchi, 1941). **Tsushima** (Kobayashi, 1941*b*). **Kyushu** (Kobayashi, 1941*b*, *c* & *e*); NAGASAKI-KEN Gottō-rettō and Iki (Kobayashi, 1941*b*); ŌITA-KEN Kawanabori (Ohfuchi, 1941); KUMAMOTO-KEN Izumi (Ohfuchi, 1937*b*); MIYAZAKI-KEN Aoi-dake (Kobayashi, 1941*c*); Tomitaka (Ohfuchi, 1937*b*); KAGOSHIMA-KEN Ibuki, Kirishima Yama & Kagoshima (Ohfuchi, 1937*b*); Kagoshima, Kaimon-dake, Shibushi & Yanakawa (Kobayashi, 1941*c*). **Osumi-Guntō** YAKU-SHIMA (Kobayashi, 1941*b* & *c*). **Okinawa-Guntō** OKINAWA-JIMA (Kobayashi, 1941*b* & *c*); Onna (Ohfuchi, 1957). **Sakishima-Guntō** IRIOMOTE-JIMA Hatoma-jima (Ohfuchi, 1957).

DISTRIBUTION. Indigenous range uncertain. Introduced by man into many parts of the world (for details see Gates, 1972*a* : 177 as *diffringens*).

Amyntas flavescens (Goto & Hatai, 1898)

flavescens Goto & Hatai, 1898 : 72.

?*producta* Goto & Hatai, 1898 : 73.

?*houletti bidenryoana* Ohfuchi, 1956 : 169.

?*leucocirca*: Ohfuchi, 1956 : 174 [*non* Chen, 1933 : 262].

?*noharuzakiensis* Ohfuchi, 1956 : 175.

DIAGNOSIS. Spermathecal pores paired in furrows 6/7/8/9. Male pores superficial on segment 18. Genital markings, serial, in line with spermathecal pores on segments 7–9; in clusters near male pores on segment 18. Intestinal caeca simple with smooth dorsal and ventral margins, originating in segment 27.

JAPANESE RECORDS. **Honshu** (**Kantō-Chihō**) TŌKYŌ-TO Tokyo (Goto & Hatai, 1898). **Sakishima-Guntō** ISHIGAKI-SHIMA Nobaru-zaki (Ohfuchi, 1956); IRIOMOTE-JIMA Hatoma-jima & Sonai (Ohfuchi, 1956).

DISTRIBUTION. Japan.

Amyntas glabrus (Gates, 1932)

glabra Gates, 1932 : 395; (syn. *vieta*) Gates, 1972*a* : 187.

vieta Gates, 1936 : 462. Japanese records: Kobayashi, 1941*c* : 378, *e* : 513.

?*papillio*: Ohfuchi, 1956 : 140 [non Gates, 1930 : 316].

DIAGNOSIS. Spermathecal pores paired, postsetal on segment 6. Male pores superficial on segment 18 with seminal grooves to paired porophores on segments 17–18. Genital markings absent. Intestinal caeca simple with smooth margins originating in segment 27.

JAPANESE RECORDS. **Kyushu** (Kobayashi, 1941*e*). **Okinawa-Guntō** OKINAWA-JIMA (Kobayashi, 1941*c*). **Sakishima-Guntō** IRIOMOTE-JIMA Hoshitate (Ohfuchi, 1956).

DISTRIBUTION. Burma and Japan.

Amyntas gracilis (Kinberg, 1867)

gracilis Kinberg, 1867 : 112.

hawayana Rosa, 1891 : 396. Japanese records: Kobayashi, 1941*c* : 378, *e* : 513; Ohfuchi, 1956 : 166.

?*kamakurensis* Goto & Hatai, 1898 : 68.

?*parvula* Goto & Hatai, 1898 : 68 [non Ohfuchi, 1956 (= *Metaphire parvula*)].

?*decimpapillata* Goto & Hatai, 1898 : 71.

?*canosa* Goto & Hatai, 1899 : 15. Japanese records: Ohfuchi, 1937*b* : 56; Kobayashi, 1941*b* : 260; Yamaguchi, 1962*a* : 1.

?*kagoshimensis* Takahashi, 1932 : 343.

DIAGNOSIS. Spermathecal pores paired, *c.* 0.30 body circumference apart in furrows 5/6/7/8. Male pores superficial on small porophore on segment 18. Genital markings small, clusters of up to 11 papillae median to the male pores on segment 18 and occasionally 17 and 19; paired median to the spermathecal pores on segments 5–8. Intestinal caeca simple with incised margins, originating in segment 27.

JAPANESE RECORDS. **Hokkaido** (Kobayashi, 1941*b*) OSHIMA Ōma (Yamaguchi, 1962). **Honshu** (**Ōu-Chihō**) (Kobayashi, 1941*b*); IWATE-KEN Kuji & Morioka (Ohfuchi, 1937*b*); YAMAGATA-KEN Sakata & Tobi-shima (Ohfuchi, 1937*b*); MIYAGI-KEN Wakuga (Ohfuchi, 1937*b*): (**Kantō-Chihō**) (Kobayashi, 1941*b*); TŌKYŌ-TO Tokyo (Goto & Hatai, 1898, 1899); KANAGAWA-KEN Kamakura (Goto & Hatai, 1898); O-shima (Kobayashi, 1941*c*): (**Chūbu-Chihō**) (Kobayashi, 1941*b*): (**Kinki-Chihō**) (Kobayashi, 1941*b*). **Shikoku** (Kobayashi, 1941*b*); EHIME-KEN Matsuyama (Ohfuchi, 1937*b*). **Tsushima** (Kobayashi, 1941*b*). **Kyushu** (Kobayashi, 1941*c* & *e*); NAGASAKI-KEN Gottō-rettō (Kobayashi, 1941*b*); KAGOSHIMA-KEN Kagoshima, Shibushi & Yanakawa (Kobayashi, 1941*c*). **Osumi-Guntō** YAKU-SHIMA (Kobayashi, 1941*c*). **Okinawa-Guntō** OKINAWA-JIMA (Kobayashi, 1941*c*); Onna (Ohfuchi, 1956).

DISTRIBUTION. Indigenous range uncertain. Introduced by man into many parts of the world (for details see Gates, 1972*a* : 189 as *hawayanus*).

Amyntas habereri (Cognetti, 1906)

habereri Cognetti, 1906 : 777.

DIAGNOSIS. Spermathecal pores closely paired in furrows 5/6/7/8/9. Male pores superficial on large porophores on segment 18. Genital markings small, paired, pre and postsetal, in line with the male pores on segments 19 and 20. Intestinal caeca manicate each with about 10 diverticula originating in segment 26.

JAPANESE RECORDS. **Honshu** (**Kantō-Chihō**) KANAGAWA-KEN, Yokohama (Cognetti, 1906).

DISTRIBUTION. Japan only.

Amyntas hilgendorfi species-complex

INCLUDED SPECIES

hilgendorfi Michaelsen, 1892 : 235; (syn. *rokugo*, *irregularis*, *schizopora*) Beddard, 1900 : 633. Other Japanese records: Michaelsen, 1899 : 9; Michaelsen, 1916 : 11; Michaelsen, 1923 : 237; Yamaguchi, 1930*a* : 50; 1930*b* : 89; Kobayashi, 1938*b* : 407; Ohfuchi, 1938*d* : 1994; Kobayashi, 1941*a* : 51, *b* : 260, *c* : 378, *d* : 459, *e* : 513; Yamaguchi, 1962*a* : 14; Nakamura, 1967 : 164; Tamura et al, 1969 : 26.

rokugo Beddard, 1892*b* : 756.

tokioensis Beddard, 1892*b* : 762.

sieboldi: Beddard, 1892*b* : 759; Goto & Hatai, 1898 : 65 [non Horst, 1883 (= *Metaphire sieboldi*)].

vittata Goto & Hatai, 1898 : 74. Other Japanese records: Cognetti, 1906 : 783; Hatai, 1929 : 271; Kobayashi, 1941*b* : 260, *c* : 378, *d* : 459, *e* : 513; Yamaguchi, 1962*a* : 16.

schizopora Goto & Hatai, 1898 : 76.

irregularis Goto & Hatai, 1899 : 13. Other Japanese records: Ohfuchi, 1938*a* : 1; Ohfuchi, 1939*a* : 81; Kobayashi, 1941*a* : 51, *b* : 260, *c* : 378, *d* : 459, *e* : 513; Yamaguchi, 1962*a* : 17.

agrestis Goto & Hatai, 1899 : 17. Other Japanese records: Hatai, 1930*b* : 651; Yamaguchi, 1930*a* : 51; Kobayashi, 1938*b* : 405; Kobayashi, 1941*a* : 51, *b* : 260, *c* : 378, *e* : 513; Yamaguchi, 1962*a* : 13; Nakamura, 1967 : 164.

glandularis Goto & Hatai, 1899 : 18. Other Japanese records: Kobayashi, 1941*b* : 260.

levis Goto & Hatai, 1899 : 20.

communissima (syn. *sieboldi*: Goto & Hatai, 1898) Goto & Hatai, 1899 : 23. Other Japanese records: Ohfuchi, 1938*d* : 1994; Kobayashi, 1941*b* : 260; Takahashi & Yamaguchi, 1961 : 1; Yamaguchi, 1962*a* : 13.

sieboldi lenzi Michaelsen, 1899 : 9.

ambigua Cognetti, 1906 : 782.

yunoshimensis Hatai, 1930*b* : 655. Other Japanese records: Kobayashi, 1941*b* : 260; Tamura et al, 1969 : 26.

tappensis Ohfuchi, 1935 : 409. Other Japanese records: Kobayashi, 1941*b* : 260.

gomejimensis Ohfuchi, 1937*a* : 18. Other Japanese records: Kobayashi, 1941*b* : 260, *c* : 378, *e* : 513.

Members of the *hilgendorfi* species-complex not recorded from Japan

gucheoensis Song & Paik, 1970.

jiriensis Song & Paik, 1971.

koreana Kobayashi, 1938*a*.

shinkeiensis Kobayashi, 1938*a*.

DIAGNOSIS. Spermathecal pores absent or paired, ventrolateral in furrows 5/6/7/8 or 6/7/8 or 6/7 or 7/8. Male pores absent or superficial. Large clusters of genital markings or indistinct pigmented areas on pre- and postclitellar segments. Intestinal caeca manicate, each with about 5 diverticula, originating in segment 27.

REMARKS. Nineteen species and subspecies are included within the *hilgendorfi* species-complex, they exhibit a wide range of variation in the expression of several characters, especially in the arrangement of genital markings, number of spermathecal furrows and the degree of development of the male pores. Insufficient data are currently available either to establish the validity of the component taxa or to recognize discrete subgroups within the complex.

JAPANESE RECORDS. 'Japan' (Beddard, 1892; Michaelsen, 1892). **Hokkaido** (Kobayashi, 1941*b* & *c*); ISHIKAI (Ohfuchi, 1938); Sapporo (Hatai, 1930*b*; Yamaguchi, 1930*a* & *b*; Nakamura, 1967); HIDAKA Hidaka-Mombetsu (Tamura et al, 1969); OSHIMA Hakodate (Michaelsen, 1892; Kobayashi, 1938*c*); Hachimano-cho in Hakodate & Fukushima (Takahashi & Yamaguchi, 1961; Yamaguchi, 1962); Gobanzakai, Mt. Hakodate, Kameda, Matsukage-cho in Hakodate, Ōno, Ōma, Yakumo & Yunokawa-cho (Yamaguchi, 1962); HIYAMA Imagane (Yamaguchi, 1962). **Honshu (Ōu-Chihō)** (Kobayashi, 1941*b* & *c*); AOMORI-KEN (Hatai, 1930*b*); Goshogawara (Ohfuchi, 1938*a*, 1939*a*); Kamome-jima (Ohfuchi, 1937*a*); Kominato (Hatai, 1929); Tappi (Ohfuchi, 1935); Tsugaru (Goto & Hatai, 1898, 1899); Yunoshima (Hatai, 1929, 1930); Asamushi, Fukaura, Hachinohe, Hamana, Imabetsu, Kanita, Kodomani, Mimmaya, Nakasato, Nishimeya, Nobeji, Oma, Sai, Sambongi, Shimofuro, Tanabu, & Yokohama (Ohfuchi, 1939*a*); AKITA-KEN Ōyu (Ohfuchi, 1938*a*, 1939*a*); Arase, Komagadake, Omagari, Takanosu & Tsuchizaki-minato (Ohfuchi, 1939*a*); IWATE-KEN (Hatai, 1930*b*); Orikabe (Ohfuchi, 1938*a*, 1939*a*); Funakoshi, Hanamaki, Kawashiri, Kuji, Kurosawijira, Miyako, Morioka, Ofunato, & Zuizan (Ohfuchi, 1939*a*); YAMAGATA-KEN Goshiki and Sakata (Ohfuchi, 1938*a*, 1939*a*); Arato, Higashine, Hondōji, Kogane, Tobi-shima & Tsuruoka (Ohfuchi, 1939*a*); MIYAGI-KEN Nakayamadaira (Ohfuchi, 1938*a*, 1939*a*); Miyagi (Hatai, 1930*b*); Sendai (Goto & Hatai, 1898, 1899, Hatai, 1929, 1930, Ohfuchi, 1939*a*); Yoshidahama (Ohfuchi, 1938*a*); Aone, Ayashi, Eno-shima, Hamayoshida, Ishinomaki, Kesennuma, Kinka-zan, Maeyachi, Okawara, Ō-shima, Shiroishi, Tō-katta & Wakuga (Ohfuchi, 1939*a*); FUKUSHIMA-KEN Aizu province (Kobayashi, 1936*f*); Kaneyama, Tadami & Yamaguchi (Ohfuchi, 1938*a*, 1939*a*); Yashiro (Ohfuchi, 1938*a*); Azuma-fuji, Nakamura, Shirakawa, Tajima, Tanagura, Tokusawa & Wakamatsu (Ohfuchi, 1939*a*); (**Kantō-Chihō**) (Kobayashi, 1941*b*); TOCHII-KEN Utsunomiya (Kobayashi, 1941*d*); IBARAKI-KEN (Goto & Hatai, 1899); Ōrami (Goto & Hatai, 1899, Hatai, 1930*b*); SAITAMA-KEN Tokorozawa (Goto & Hatai, 1899, Hatai, 1930*b*); TŌKYŌ-TO, Tokyo (Goto & Hatai, 1898, 1899); KANAGAWA-KEN Kamakura (Goto & Hatai, 1898); Misaki (Michaelsen, 1923); Ō-Shima (Hatai, 1929, 1930*b*); Yokohama (Michaelsen, 1892, Cognetti, 1906); (**Chūbu-Chihō**) (Kobayashi, 1941*b*, *c*); YAMANASHI-KEN Fijii-san (Michaelsen, 1916); SHIZUOKA-KEN (Goto & Hatai, 1898, 1899); (**Kinki-Chihō**) (Kobayashi, 1941*b*, *c*); HYOGO-KEN Nakahama (Michaelsen, 1899); (**Chūgoku-Chihō**) (Kobayashi, 1941*b*, *c*); SHIMANE-KEN Oki-guntō (Kobayashi, 1941*a*, *b*); OKAYAMA-KEN Bitiu district & Takahashi (Goto & Hatai, 1899). **Shikoku** (Kobayashi, 1941*b*, *c*); EHIME-KEN Matsugama (Hatai, 1930*b*); Unajima

(Goto & Hatai, 1899, Michaelsen, 1916, Hatai, 1929). **Tsushima** (Kobayashi, 1941*b*). **Kyushu** (Kobayashi, 1941*b, c, e*); NAGASAKI-KEN Iki (Kobayashi, 1941*b*); KUMAMOTO-KEN Kumamoto (Goto & Hatai, 1899); MIYAZAKI-KEN Aoi-dake (Kobayashi, 1941*c*), Tomitaka (Hatai, 1930*b*); KAGOSHIMA-KEN Kagoshima (Hatai, 1930*b*, Kobayashi, 1941*c*); Kirishima Yama (Hatai, 1929, Kobayashi, 1941*c*); Sakura-jima (Hatai, 1929); Kaimon-dake, Shibushi, & Yanakawa (Kobayashi, 1941*c*). **Osumi-Guntō** Yaku-shima (Kobayashi, 1941*b, c*).

DISTRIBUTION. Japan and Korea, two taxa, *hilgendorfi* and *levis*, introduced into North America.

Amyntas hupiensis (Michaelsen, 1895)

hupiensis Michaelsen, 1895 : 35. Japanese records: Michaelsen, 1899 : 6; Ohfuchi, 1938*d* : 1993; Kobayashi, 1941*b* : 260, *c* : 378, *d* : 459, *e* : 513; Yamaguchi, 1962*a* : 9; Nakamura, 1967 : 164.

DIAGNOSIS. Spermathecal pores paired, *c.* 0·16 body circumference apart in furrows 6/7/8/9. Male pores superficial on small porophore on segment 18. Genital markings large paired intersegmental in line with the male pores at 17/18 and 18/19. Intestinal caeca simple with smooth margins, originating in segment 27.

JAPANESE RECORDS. **Hokkaido** ISHIKAI (Ohfuchi, 1938*d*); Sapporo (Nakamura, 1967); OSHIMA Hachimano-cho & Maksukage-cho in Hakodate & Ono (Yamaguchi, 1962). **Honshu** (**Ōu-Chihō**) (Kobayashi, 1941*b* & *c*): (**Kantō-Chihō**) (Kobayashi, 1941*b*); TOCHII-KEN Utsunomiya (Kobayashi, 1941*d*): (**Chūbu-Chihō**) (Kobayashi, 1941*b* & *c*): (**Kinki-Chihō**) (Kobayashi, 1941*b* & *c*); HYOGO-KEN Nakahama (Michaelsen, 1899): (**Chūgoku-Chihō**) (Kobayashi, 1941*b* & *c*). **Shikoku** (Kobayashi, 1941*b* & *c*). **Kyushu** (Kobayashi, 1941*b, c* & *e*); NAGASAKI-KEN Iki (Kobayashi, 1941*b*); KAGOSHIMA-KEN Kagoshima & Shibushi (Kobayashi, 1941*c*). **Okinawa-Guntō** OKINAWA-JIMA (Kobayashi, 1941*b* & *c*).

DISTRIBUTION. China and Japan, introduced into North America and New Zealand.

Amyntas illotus species-group

illotus species-group Sims & Easton, 1972 : 236.

DIAGNOSIS. Spermathecal pores absent. Male pores superficial. Intestinal caeca simple, originating in or near segment 27.

REMARKS. This species-group was recognized by Sims & Easton (1972) to accommodate several poorly described species which lack spermathecal pores. These species do not have any special affinities with one another, instead the group is one of convenience. It is highly probable that when more data become available most of the included species will be found to be synonymous with other thecate species. Two species have been recorded from Japan: *A. illotus* and *A. pusillus*.

For convenience the athecate species '*Pheretima*' *oyuensis* Ohfuchi, 1956 is also considered here although it is not a member of the *illotus* species-group. This species was considered *incertae sedis* by Sims & Easton (1972) since it lacks male pores, the structure of which are diagnostic of the caecate genera *Amyntas*, *Metaphire* and *Pheretima*.

Amyntas 'illotus' (Gates, 1932)

illota: Ohfuchi, 1956 : 136 (*non* Gates, 1932 : 397).

DIAGNOSIS. Length 125–155 mm, 125–144 segments. Genital markings absent. 109–114 setae on segment *vii*.

REMARKS. The diagnosis of *A. illotus* was restricted by Gates (1972*a* : 196) to exclude the Japanese specimens identified by Ohfuchi. They cannot be assigned to another species but it is not proposed to recognize a new species to accommodate them since it is probable that

when more data become available, they will be found to belong to a previously described species.

JAPANESE RECORDS. **Sakishima-Guntō** ISHIGAKI-SHIMA Ibaruma (Ohfuchi, 1956); IRIOMOTE-JIMA Hatoma-jima & Hoshitate (Ohfuchi, 1956).

DISTRIBUTION. Japan.

Amyntas pusillus (Ohfuchi, 1956)

pusilla Ohfuchi, 1956 : 136 [non Ude, 1893 : 63 (= *Amyntas minimus*)].

DIAGNOSIS. Length 44–50 mm, 75–93 segments. Genital markings absent. 33–37 setae on *vii*.

JAPANESE RECORDS. **Sakishima-Guntō** IRIOMOTE-JIMA Sonai (Ohfuchi, 1956).

DISTRIBUTION. Japan.

'*Pheretima*' *oyuensis* Ohfuchi, 1937

oyuensis Ohfuchi, 1937a : 24.

DIAGNOSIS. Length 50–55 mm, 87–94 segments. Male pores and prostates absent. Genital markings absent. *C*. 38 setae on *vii*.

JAPANESE RECORDS. **Honshu (Ōu-Chihō)** AKITA-KEN Inariyama, Oyu Katstuno district (Ohfuchi, 1937).

DISTRIBUTION. Japan.

Amyntas japonicus (Horst, 1883)

japonica Horst, 1883 : 192.

DIAGNOSIS. Spermathecal pores paired, *c*. 0.43 body circumference apart in furrows 6/7/8. Male pores superficial on segment 18 in seminal grooves which extend onto segment 17. Genital markings absent. Intestinal caeca manicate, each with about 8 diverticula, originating in segment 26.

JAPANESE RECORDS. 'Japan' (Horst, 1883).

DISTRIBUTION. Japan.

Amyntas megascolidioides (Goto & Hatai, 1899)

megascolidioides Goto & Hatai, 1899 : 21. Other Japanese records: Kobayashi, 1941a : 51, b : 260.

DIAGNOSIS. Spermathecal pores paired, in furrows 4/5/6/7/8/9. Male pores superficial on segment 19. Genital markings small, paired, postsetal in line with the male pores on segments 17, 18 and 20. Intestinal caeca simple, originating in segment 27.

JAPANESE RECORDS. **Honshu (Ōu-Chihō)** (Kobayashi, 1941b): (**Kantō-Chihō**) TŌKYŌ-TO Tokyo (Goto & Hatai, 1899): (**Chūbu-Chihō**) (Kobayashi, 1941b): (**Kinki-Chihō**) (Kobayashi, 1941b): (**Chūgoku-Chihō**) (Kobayashi, 1941b); SHIMANE-KEN Oki-guntō (Kobayashi, 1941a & b). **Shikoku** (Kobayashi, 1941b). **Tsushima** (Kobayashi, 1941b). **Kyushu** (Kobayashi, 1941b).

DISTRIBUTION. Korea and Japan.

Amyntas micronarius (Goto & Hatai, 1898)

micronaria Goto & Hatai, 1898 : 74. Other Japanese records: Ohfuchi, 1937b : 50; Kobayashi, 1941b : 260, c : 378, d : 459, e : 513; Yamaguchi, 1962a : 8.

shimaensis Goto & Hatai, 1899 : 15. Other Japanese records: Kobayashi, 1941b : 260.

Yamizoyamensis Ohfuchi, 1935 : 413. Other Japanese records: Ohfuchi, 1937b : 133.
?obtusa Ohfuchi, 1957 : 244.

DIAGNOSIS. Spermathecal pores paired, *c.* 0.30 body circumference apart in furrows 5/6/7/8/9. Male pores superficial on small porophores on segment 18. Genital markings large paired, intersegmental in furrows 17/18, 18/19 and occasionally 19/20. Intestinal caeca simple with smooth margins, originating in segment 27.

JAPANESE RECORDS. **Hokkaido** OSHIMA Hachimano-cho in Hakodate (Yamaguchi, 1962). **Honshu (Ōu-Chihō)** (Kobayashi, 1941*b* & *c*); MIYAGI-KEN Sendai (Ohfuchi, 1937*b*); FUKUSHIMA-KEN Yamizo-san (Ohfuchi, 1937*b*): (**Kantō-Chihō**) (Kobayashi, 1941*b*); GUMMA-KEN Shima (Goto & Hatai, 1899); TOCHU-KEN Utsunomiya (Kobayashi, 1941*d*); TŌKYŌ-TO Tokyo (Goto & Hatai, 1898): (**Chūbu-Chihō**) (Kobayashi, 1941*b* & *c*): (**Kinki-Chihō**) (Kobayashi, 1941*b* & *c*): (**Chūgoku-Chihō**) (Kobayashi, 1941*b* & *c*). **Shikoku** (Kobayashi, 1941*b* & *c*). **Kyushu** (Kobayashi, 1941*b*, *c* & *d*); NAGASAKI-KEN Gottō-rettō (Kobayashi, 1941*b*); MIYAZAKI-KEN Aoi-dake (Kobayashi, 1941*c*). **Sakishima-Guntō** IRIOMOTE-JIMA Sonai (Ohfuchi, 1957).

DISTRIBUTION. Japan.

Amyntas minimus (Horst, 1893)

minimus Horst, 1893 : 66.

zoysiae Chen, 1933 : 288. Japanese records: Kobayashi, 1941*c* : 378, *e* : 513.

ishikawai Ohfuchi, 1941 : 248. Other Japanese records: Kobayashi, 1941*b* : 260.

DIAGNOSIS. Spermathecal pores paired, *c.* 0.52 body circumference apart in furrow 5/6 only. Male pores superficial on small porophores on segment 18. Genital markings small on pre and postclitellar segments. Intestinal caeca simple with smooth margins, originating in segment 27.

JAPANESE RECORDS. **Honshu (Kantō-Chihō)** KANAGAWA-KEN Ō-shima (Kobayashi, 1941*c*). **Shikoku** (Kobayashi, 1941*b*); KŌCHI-KEN Mt Sampōzan (Ohfuchi, 1941). **Kyushu** (Kobayashi, 1941*c* & *e*); KAGOSHIMA-KEN Yanakawa (Kobayashi, 1941*c*). **Osumi-Guntō** YAKU-SHIMA (Kobayashi, 1941*c*). **Okinawa-Guntō** OKINAWA-JIMA (Kobayashi, 1941*c*).

DISTRIBUTION. Indigenous range uncertain. Introduced by man into many parts of the world (for details see Gates, 1972*a* : 201).

Amyntas morrisi (Beddard, 1892)

morrisi Beddard, 1892*a* : 166. Japanese records: Kobayashi, 1941*c* : 378, *e* : 513; Ohfuchi, 1956 : 143.

elongata: Ohfuchi, 1956 : 148 [non Perrier, 1872 : 124 (= *Polypheretima elongata*)].

exiloides: Ohfuchi, 1956 : 142 (non Chen, 1936 : 288).

DIAGNOSIS. Spermathecal pores paired, *c.* 0.50 body circumference apart in furrows 5/6/7. Male pores superficial on small porophores on segment 18. Genital markings small, slightly median to spermathecal pores; single median on segments 6–8; in transverse rows of up to 4, pre- and postsetal on postclitellar segments and 1 or 2 closely associated with the male pores. Intestinal caeca, simple with an incised ventral margin, originating in segment 27.

JAPANESE RECORDS. **Honshu (Kantō-Chihō)** KANAGAWA-KEN Ō-shima (Kobayashi, 1941*c*). **Kyushu** (Kobayashi, 1941*c* & *e*) KAGOSHIMA-KEN Shibushi (Kobayashi, 1941*c*). **Osumi-Guntō** YAKU-SHIMA (Kobayashi, 1941*c*). **Okinawa-Guntō** OKINAWA-JIMA (Kobayashi, 1941*c*) Higaki near Onna (Ohfuchi, 1956). **Sakishima-Guntō** ISHIGAKI-SHIMA (Ohfuchi, 1956); IRIOMOTE-JIMA Obama-jima & Sonai (Ohfuchi, 1956).

DISTRIBUTION. Indigenous range uncertain. Introduced by man into many parts of the world (for details see Gates, 1972*a* : 202).

Amyntas obscurus (Goto & Hatai, 1898)

obscura Goto & Hatai, 1898 : 70.

DIAGNOSIS. Spermathecal pores paired, postsetal on segments 6, 7 and 8. Male pores superficial on segment 18. Genital markings median to male pores, pre- and postsetal on segment 18, postsetal on segment 19. Intestinal caeca simple, originating in segment 27.

JAPANESE RECORDS. **Honshu (Kantō-Chihō)** KANAGAWA-KEN Kamakura (Goto & Hatai, 1898).

DISTRIBUTION. Japan.

Amyntas papulosus (Rosa, 1896)

papulosa Rosa, 1896 : 525; (syn. *papulosa sauteri*, ?*rockefelleri*) Gates, 1972a : 206.

papulosa sauteri Michaelsen, 1922 : 26. Japanese records: Ohfuchi, 1956 : 164.

rockefelleri Chen, 1933 : 238. Japanese records: Kobayashi, 1941c : 378, e : 513.

DIAGNOSIS. Spermathecal pores paired, c. 0.25 body circumference apart in furrows 5/6/7/8. Male pores superficial on small porophores on segment 18. Genital markings small, numerous, in pre- and postsetal rows on segments 6–9 and 17–19. Intestinal caeca simple with smooth margins, originating in segment 27.

REMARKS. This species may be confused with *A. gracilis* from which it differs only in its different arrangement of genital markings and smaller size (*papulosus* = 45–78 mm; *gracilis* = 56–156 mm).

JAPANESE RECORDS. **Kyushu** (Kobayashi, 1941e). **Osumi-Guntō** YAKU-SHIMA (Kobayashi, 1941c). **Sakishima-Guntō** ISHIGAKI-SHIMA (Ohfuchi, 1956); IRIOMOTE-JIMA Hoshitate & Sonaidake (Ohfuchi, 1956).

DISTRIBUTION. Japan, China, Taiwan, Burma, Thailand, Sumatra.

Amyntas parvicystis (Goto & Hatai, 1899)

parvicystis Goto & Hatai, 1899 : 18. Other Japanese records: Kobayashi, 1941b : 260.

DIAGNOSIS. Spermathecal pores paired, presetal on segments 7 and 8. Male pores superficial on small porophores on segment 18. Genital markings small in the intersegmental furrows in front of the spermathecal pores and median to the male pores on 18. Intestinal caeca simple with an incised ventral and dorsal margins, originating in segment 26.

JAPANESE RECORDS. **Honshu (Kantō-Chihō)** IBARAKI-KEN Ōarami (Goto & Hatai, 1899). **Shikoku** (Kobayashi, 1941b); EHIME-KEN Uwajima (Goto & Hatai, 1899).

DISTRIBUTION. Japan.

Amyntas robustus (Perrier, 1872)

robusta Perrier, 1872 : 112; (syn. *campestris*, *corrugata*, *lauta*, *mastakae*) Ljungstöm, 1971 : 27.

Japanese records: Kobayashi, 1941b : 261; c : 378; e : 513.

mastakae Beddard, 1892b : 761. Japanese records: Ohfuchi, 1938c : 62; Kobayashi, 1941b : 260, e : 513.

campestris Goto & Hatai, 1898 : 67 [non Lee, 1952 : 39 (= *Amyntas corticus*)].

lauta Ude, 1905 : 405. Japanese records: Ohfuchi, 1956 : 155.

corrugata Chen, 1931 : 131. Japanese records: Ohfuchi, 1956 : 162.

DIAGNOSIS. Spermathecal pores paired, c. 0.50 body circumference apart in furrows 7/8/9. Male pores superficial on small, paired porophores on segment 18. Genital markings small, numerous on segments 7, 8 and 18. Intestinal caeca simple with incised ventral margins, originating in segment 27.

JAPANESE RECORDS. 'Japan' (Beddard, 1892). **Honshu (Kantō-Chihō)** KANAGAWA-KEN Kamakura (Goto & Hatai, 1898); Ō-shima (Kobayashi, 1941*b* & *c*): (**Chūbu-Chihō**) (Kobayashi, 1941*b*): (**Kinki-Chihō**) (Kobayashi, 1941*b* & *c*): WAKAYAMA-KEN Gobō Machi (Ohfuchi, 1938*c*). **Shikoku** (Kobayashi, 1941*b* & *c*); KŌCHI-KEN Mt Sampōzan (Ohfuchi, 1941). **Tsushima** (Kobayashi, 1941*b*). **Kyushu** (Kobayashi, 1941*b*, *c* & *e*); NAGASAKI-KEN Gottō-rettō (Kobayashi, 1941*b*). **Okinawa-Guntō** OKINAWA-JIMA (Kobayashi, 1941*b* & *c*); Onna & Shiragaki (Ohfuchi, 1956). **Sakishima-Guntō** ISHIGAKI-SHIMA (Ohfuchi, 1956).

DISTRIBUTION. Indigenous range uncertain. Introduced into many parts of the world by man (for details see Ljungstöm, 1971 : 27).

Amyntas scholasticus (Goto & Hatai, 1898)

scholastica Goto & Hatai, 1898 : 70.

DIAGNOSIS. Spermathecal pores paired, in furrows 4/5/6/7/8. Male pores superficial on segment 18. Genital markings absent. Intestinal caeca simple with smooth margins, originating in segment 27.

JAPANESE RECORDS. **Honshu (Kantō-Chihō)** TŌKYŌ-TO Tokyo (Goto & Hatai, 1898).

DISTRIBUTION. Japan.

Metaphire californica (Kinberg, 1867)

californica Kinberg, 1867 : 102. Japanese records: Kobayashi, 1941*b* : 260, *c* : 378, *e* : 513; Ohfuchi, 1956 : 158.

?*sakaguchii* Ohfuchi, 1938*c* : 53. Japanese records: Ohfuchi, 1941 : 252.

?*sonaiensis* Ohfuchi, 1956 : 154.

DIAGNOSIS. Spermathecal pores paired, *c.* 0.50 body circumference apart in furrows 7/8/9. Male pores within copulatory pouches on segment 18. Genital markings absent. Intestinal caeca simple often with incised dorsal and ventral margins, originating in segment 27.

JAPANESE RECORDS. **Honshu (Kantō-Chihō)** KANAGAWA-KEN Ō-shima (Kobayashi, 1941*b* & *c*): (**Kinki-Chihō**) (Kobayashi, 1941*b* & *c*); WAKAYAMA-KEN Gobō Machi (Ohfuchi, 1938*c*): (**Chūgoku-Chihō**) (Kobayashi, 1941*b* & *c*). **Shikoku** (Kobayashi, 1941*b* & *c*); KŌCHI-KEN Mt Sampōzan & Nishibun-mura (Ohfuchi, 1938*c*). **Tsushima** (Kobayashi, 1941*b*). **Kyushu** (Kobayashi, 1941*b*, *c* & *e*); NAGASAKI-KEN Gottō-rettō & Iki (Kobayashi, 1941*b*); KAGOSHIMA-KEN Kagoshima & Yanakawa (Kobayashi, 1941*c*). **Okinawa-Guntō** OKINAWA-JIMA (Kobayashi, 1941*b* & *c*); Shiragaki (Ohfuchi, 1956). **Sakishima-Guntō** IRIOMOTE-JIMA Sonai (Ohfuchi, 1956).

DISTRIBUTION. Indigenous range uncertain. Introduced by man into many parts of the world (for details see Gates, 1972*a* : 174).

Metaphire fuscata (Goto & Hatai, 1898)

fuscata Goto & Hatai, 1898 : 66.

?*grossa* Goto & Hatai, 1898 : 75. Other Japanese records: Ohfuchi, 1937*b* : 33; Kobayashi, 1941*b* : 260.

DIAGNOSIS. Spermathecal pores paired, *c.* 0.20 body circumference apart in furrows 5/6/7/8/9. Spermathecal diverticula convoluted. Male pores within copulatory pouches on segment 18. Genital markings paired, postsetal, slightly median to the male pores on segments 17–22, sometimes slightly median to the spermathecal pores on segments 5–8. Intestinal caeca simple with incised dorsal and ventral margins, originating in segment 27.

JAPANESE RECORDS. **Honshu (Ōu-Chihō)** (Kobayashi, 1941*b*); MIYAGI-KEN Yagiyaama in Sendai (Ohfuchi, 1937*b*); FUKUSHIMA-KEN Yamizo-san (Ohfuchi, 1937*b*): (**Kantō-Chihō**)

(Kobayashi, 1941*b*); KANAGAWA-KEN Kamakura (Goto & Hatai, 1898): (Chūhu-Chihō) (Kobayashi, 1941*b*); YAMANASHI-KEN Kawaguchi (Goto & Hatai, 1898).

DISTRIBUTION. Japan.

Metaphire hataii (Ohfuchi, 1937)

hataii Ohfuchi, 1937*a* : 13.

DIAGNOSIS. Spermathecal pores paired, *c.* 0.37 body circumference apart in furrows 5/6/7/8. Male pores within copulatory pouches on segment 18. Genital markings large, paired on segments 7 and 18. Intestinal caeca manicate, each with 6 diverticula, originating in segment 27.

JAPANESE RECORDS. Honshu (Ōu-Chihō) IWATE-KEN Kyū-sakurayama near Morioka (Ohfuchi, 1937*a*).

DISTRIBUTION. Japan.

Metaphire parvula (Ohfuchi, 1956)

parvula Ohfuchi, 1956 : 152 [non Goto & Hatai, 1898 : 68 (= *Amyntas gracilis*)].

DIAGNOSIS. Spermathecal pores paired, ventrolateral in furrows 6/7/8. Male pores within copulatory pouches on segment 18. Genital markings absent. Intestinal caeca simple with smooth margins, originating in segment 27.

JAPANESE RECORDS. Sakishima-Guntō IRIOMOTE-JIMA Sonai (Ohfuchi, 1956).

DISTRIBUTION. Japan.

Metaphire peguana (Rosa, 1890)

peguana Rosa, 1890 : 113. Japanese records: Ohfuchi, 1956 : 171.

DIAGNOSIS. Spermathecal pores paired, *c.* 0.28 body circumference apart in furrows 6/7/8/9. Male pores within copulatory pouches on segment 18. Genital markings large, paired, inter-segmental in furrows 17/18 and 18/19. Intestinal caeca simple with smooth margins, originating in segment 27.

REMARKS. Gates (1972*a*) was of the opinion that Ohfuchi's record cannot be accommodated within this species but he did not indicate to which species it could be assigned.

JAPANESE RECORDS. Sakishima-Guntō ISHIGAKI-SHIMA Ibaruma (Ohfuchi, 1956).

DISTRIBUTION. Burma, Thailand, Vietnam, Malaya, Java, Borneo and Japan.

Metaphire riukiuensis (Ohfuchi, 1957)

riukiuensis Ohfuchi, 1957 : 248.

DIAGNOSIS. Spermathecal pores paired in furrows 5/6/7/8/9. Male pores within copulatory pouches the openings of which occupy segments 17, 18 and 19. (or ? in seminal grooves). Genital markings absent. Intestinal caeca simple with incised ventral margins, originating in segment 27.

JAPANESE RECORDS. Sakishima-Guntō MIYAKO-JIMA (Ohfuchi, 1957); ISHIGAKI-SHIMA (Ohfuchi, 1957); IRIOMOTE-JIMA Hatoma-jima, Hoshitate & Sonai (Ohfuchi, 1957).

DISTRIBUTION. Japan.

Metaphire schmardae (Horst, 1883)

schmardae Horst, 1883 : 194. Other Japanese records: Michaelsen, 1892 : 235; Kobayashi, 1941*b* : 261, *c.* 378, *e.* 513. *kikuchii* Hatai & Ohfuchi, 1936 : 767.

DIAGNOSIS. Spermathecal pores paired, ventrolateral in furrows 7/8/9. Male pores within copulatory pouches on segment 18. Genital markings absent. Intestinal caeca manicate, each with 5 diverticula, originating in segment 27.

JAPANESE RECORDS. 'Japan' (Horst, 1883; Michaelsen, 1892). **Honshu** (**Ōu-Chihō**) FUKUSHIMA-KEN Nakamura (Hatai & Ohfuchi, 1936): (**Kantō-Chihō**) (Kobayashi, 1941*b*); IBARAKI-KEN Hirakata, Mito & Onuka (Hatai & Ohfuchi, 1936); KANAGAWA-KEN Ō-shima (Kobayashi, 1941*b* & *c*): (**Chūbu-Chihō**) (Kobayashi, 1941*b* & *c*): (**Kinki-Chihō**) (Kobayashi, 1941*b* & *c*): (**Chūgoku-Chihō**) (Kobayashi, 1941*b* & *c*). **Shikoku** (Kobayashi, 1941*b* & *c*). **Tsushima** (Kobayashi, 1941*b*). **Kyushu** (Kobayashi, 1941*b*, *c* & *e*); NAGASAKI-KEN Gottō-rettō & Iki (Kobayashi, 1941*b*); KAGOSHIMA-KEN Kagoshima & Shibushi (Kobayashi, 1941*c*). **Okinawa-Guntō** OKINAWA-JIMA (Kobayashi, 1941*b* & *c*).

DISTRIBUTION. Japan, China, Taiwan. Also introduced by man into several countries outside of the *Pheretima* domain.

Metaphire servina (Hatai & Ohfuchi, 1937)

servina Hatai & Ohfuchi, 1937 : 1.

DIAGNOSIS. Spermathecal pores paired, *c.* 0.50 body circumference apart in furrows 6/7/8/9. Spermathecal diverticula present. Male pores in copulatory pouches behind the setal line on segment 18. Secretory diverticula absent. Genital markings small, paired, median to the male pores on segment 18. Intestinal caeca manicate each with 6 diverticula, originating in segment 27.

JAPANESE RECORDS. **Honshu** (**Ōu-Chihō**) AOMORI-KEN Asamushi (Hatai & Ohfuchi, 1937); MIYAGI-KEN Aji-shima, Ashi-jima, Eno-shima, Hira-jima, Izu-shima, Kinkazan, Kunimitōge near Sendai, Onagawa, O-shima & Tashiro-jima (Hatai & Ohfuchi, 1937).

DISTRIBUTION. Japan.

Metaphire sieboldi (Horst, 1883)

sieboldi Horst, 1883 : 191. Other Japanese records: Rosa, 1891 : 401; Michaelsen, 1892 : 235; Hatai, 1931 : 398; Kobayashi, 1941*b* : 260, *c* : 378, *e* : 513 [non Goto & Hatai, 1898 : 65; Beddard, 1892*b* : 759 (= *hilgendorfi* species-complex)].

setosa Cognetti, 1908 : 1.

DIAGNOSIS. Spermathecal pores paired, *c.* 0.31 body circumference apart in furrows 6/7/8/9. Male pores within shallow copulatory pouches on segment 18. Secretory diverticula absent. Genital markings absent. Intestinal caeca manicate, each usually with 5 diverticula, originating in segment 27.

JAPANESE RECORDS. 'Japan' (Horst, 1883; Rosa, 1891; Michaelsen, 1892). **Honshu** (**Chūbu-Chihō**) (Kobayashi, 1941*b* & *c*): (**Kinki-Chihō**) (Kobayashi, 1941*b* & *c*): (**Chūgoku-Chihō**) (Kobayashi, 1941*b* & *c*). **Shikoku** (Hatai, 1930; Kobayashi, 1941*b* & *c*); TOKUSHIMA-KEN (Cognetti, 1908). **Kyushu** (Kobayashi, 1941*b*, *c* & *e*); MIYAZAKI-KEN Aoi-dake (Kobayashi, 1941*c*); KAGOSHIMA-KEN Kagoshima, Kaimon-dake & Kirishima Yama (Kobayashi, 1941*c*).

DISTRIBUTION. Japan.

Metaphire tosaensis (Ohfuchi, 1938)

tosaensis Ohfuchi, 1938*c* : 58. Other Japanese records: Kobayashi, 1941*b* : 260, *c* : 378.

DIAGNOSIS. Spermathecal pores paired, *c.* 0.25 body circumference apart in furrows 5/6/7/8/9. Male pores in copulatory pouches restricted to segment 18. Genital markings absent. Intestinal caeca simple with incised dorsal margins, originating in segment 27.

JAPANESE RECORDS: **Honshu** (**Kinki-Chihō**) NARA-KEN Tosa (Ohfuchi, 1938*c*). **Shikoku**

(Kobayashi, 1941*b* & *c*). **Kyushu** (Kobayashi, 1941*b* & *c*); MIYAZAKI-KEN Aoi-dake (Kobayashi, 1941*c*); KAGOSHIMA-KEN Kagoshima & Kirishima Yama (Kobayashi, 1941*c*).

DISTRIBUTION. Japan.

Metaphire yamardai (Hatai, 1930)

yamardai Hatai, 1930*b* : 664. Other Japanese records: Kobayashi, 1941*b* : 260.

soulensis Kobayashi, 1938*a* : 131. Other Japanese records: Kobayashi, 1941*a* : 51, *b* : 260, *c* : 378, *e* : 513.

DIAGNOSIS. Spermathecal pores paired, *c.* 0.43 body circumference apart in furrows 6/7/8/9. Male pores within copulatory pouches on segment 18. Genital markings small, median to the spermathecal pores on segments 7 and 8, and within the copulatory pouches. Intestinal caeca manicate each with 5 or 6 diverticula, originating in segment 27.

JAPANESE RECORDS. **Honshu (Chūbu-Chihō)** (Kobayashi, 1941*b* & *c*); ISHAKAWA-KEN Hatai (Hatai, 1930*b*): (**Kinki-Chihō**) (Kobayashi, 1941*b* & *c*); HYOGO-KEN Kōbe (Hatai, 1930*b*); WAKAYAMA-KEN (Hatai, 1930*b*): (**Chūgoku-Chihō**) (Kobayashi, 1941*b* & *c*); TOTTORI-KEN (Hatai, 1930*b*); SHIMANE-KEN Oki-guntō (Kobayashi, 1941*a* & *b*); OKAYAMA-KEN (Hatai, 1930*b*). **Shikoku** (Kobayashi, 1941*b* & *c*). **Tsushima** (Kobayashi, 1941*b*). **Kyushu** (Kobayashi, 1941*b*, *c* & *e*); KAGOSHIMA-KEN Kaimon-dake (Kobayashi, 1941*c*).

DISTRIBUTION. Japan, China, Korea.

Metaphire yezoensis (Kobayashi, 1938)

yezoensis Kobayashi, 1938*b* : 412.

DIAGNOSIS. Spermathecal pores paired, *c.* 0.29 body circumference apart in furrows 5/6/7/8. Male pores in copulatory pouches on segment 18. Genital markings absent. Intestinal caeca simple with incised ventral margins, originating in segment 27.

JAPANESE RECORDS. **Hokkaido** OSHIMA Hakodate (Kobayashi, 1938*b*).

DISTRIBUTION. Japan.

Pheretima (Parapheretima) koellikeri Michaelsen, 1928

Pheretima sp. Michaelsen, 1903 : 100.

koellikeri Michaelsen, 1928 : 8. Other Japanese records: Kobayashi, 1941*e* : 513.

?*vesiculata* Goto & Hatai, 1899 : 21.

DIAGNOSIS. Spermathecal pores paired, *c.* 0.40 body circumference apart in furrows 6/7/8. Spermathecal diverticula present. Male pores in copulatory pouches in the setal line of segment 18. Secretory diverticula discharge into copulatory pouches. Genital markings absent. Intestinal caeca manicate, each with several diverticula, originating in segment 27.

JAPANESE RECORDS. 'Japan' (Michaelsen, 1928). **Honshu (Kantō-Chihō)** IBARAKI-KEN Oarai (Goto & Hatai, 1899): (**Chūgoku-Chihō**) OKAYAMA-KEN Takahashi (Goto & Hatai, 1899). **Kyushu** (Kobayashi, 1941*e*).

DISTRIBUTION. Japan.

Pithemera bicincta (Perrier, 1875)

bicincta Perrier, 1875 : 1044. Japanese records: Ohfuchi, 1957 : 254.

DIAGNOSIS. Spermathecal pores paired, *c.* 0.26 body circumference apart in furrows 4/5/6/7/8/9. Male pores superficial on segment 18. Genital markings large paired median to male pores and extending onto segments 17 and 19. Intestinal caeca simple with smooth margins, originating in segment 22.

JAPANESE RECORDS. **Sakishima-Guntō** ISHIGAKI-SHIMA Ibarama (Ohfuchi, 1957); IRIOMOTE-JIMA Hatoma-jima (Ohfuchi, 1957).

DISTRIBUTION. Indigenous range uncertain. This species has been introduced into many parts of the world by man (for details see Gates, 1972a : 170).

Polypheretima elongata (Perrier, 1872)

elongata Perrier, 1872 : 124; Easton, 1979 : 53. Japanese records: Kobayashi, 1941c : 378 [non Ohfuchi, 1956 : 148 (= *Amyntas morrisi*)].
biserialis Perrier, 1875 : 1044. Japanese records: Ohfuchi, 1956 : 151.

DIAGNOSIS. Spermathecal pores absent or in paired ventrolateral batteries of 0–5 pores in furrows 5/6 or 6/7 or 5/6/7. Male pores in copulatory pouches on segment 18. Genital markings large, paired, presetal, in line with the male pores on segments 19–24. Intestinal caeca absent.

JAPANESE RECORDS. **Okinawa-Guntō** OKINAWA-JIMA (Kobayashi, 1941c); Higaki (Ohfuchi, 1956). **Sakishima-Guntō** IRIOMOTE-JIMA Obama-jima (Ohfuchi, 1956).

DISTRIBUTION. Indigenous range: East Java, ? Madura, Bali, Lombok, Flores, ? south Celebes (Easton, 1976 : 41). Introduced into many parts of the world by man (Easton, 1979 : 53).

Polypheretima iizukai (Goto & Hatai, 1899)

iizukai Goto & Hatai, 1899 : 14; Easton, 1979 : 43. Other Japanese records: Ohfuchi, 1937b : 39; Kobayashi, 1941b : 260.

DIAGNOSIS. Spermathecal pores paired in furrows 5/6/7/8/9. Male pores superficial on small porophores on segment 18. Genital markings large, paired, postsetal, in line with the male pores on segments 19–23. Intestinal caeca absent.

JAPANESE RECORDS. **Honshu (Kantō-Chihō)** (Kobayashi, 1941b); 'Mt Takao, near Tokyo' (Ohfuchi, 1937b); SAITAMA-KEN (Goto & Hatai, 1899); **(Chūbu-Chihō)** (Kobayashi, 1941b).

DISTRIBUTION. Japan.

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Manuscript accepted for publication 8 September 1980